E. M. Baker

The Monthly Review

AMERICAN ELECTROPLATER'S SOCIETY

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTROPLATING

PRODUCTION for VICTORY

USING

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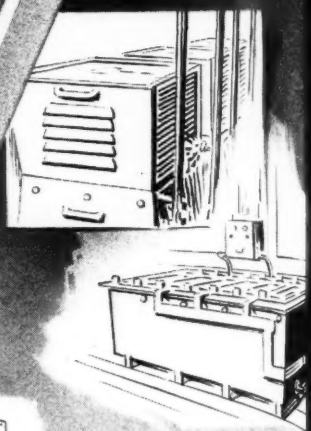

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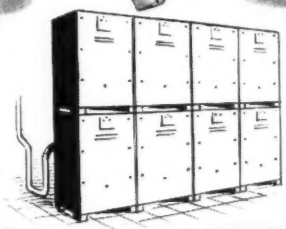

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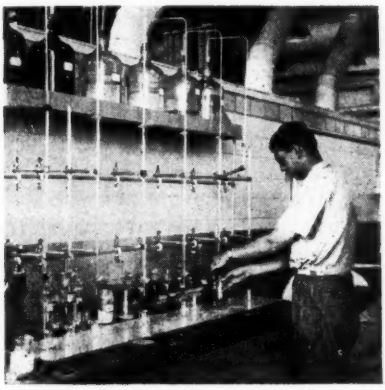
VOL. XXIX FEBRUARY 1942 NO. 2



COVER

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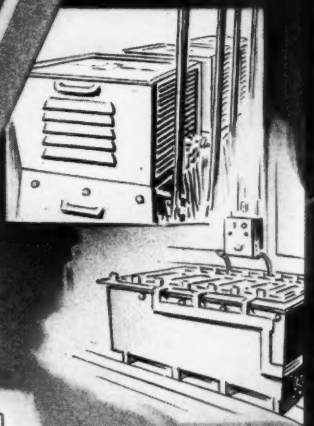

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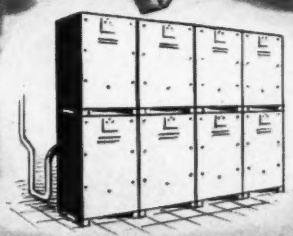

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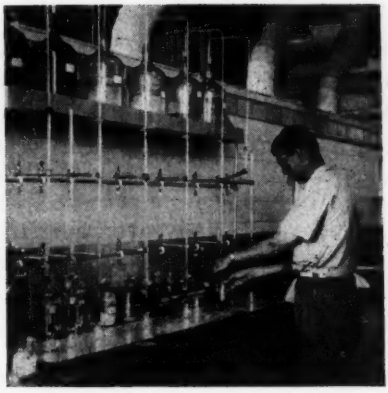

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Editorial

The committee in charge of the Grand Rapids Convention, with the sanction of the members of the Executive Board of the A.E.S., has decided to make several changes that are necessary because of conditions which confront the Society this year necessitating a distinct departure from past annual meetings.

Because of the desire of many persons usually attending the Conventions not to be absent from their places of business longer than is necessary, the days have been changed from four to three, Monday, Tuesday, and Wednesday, June 8-9-10.

On account of the metal shortage, which seems to grow more acute each month, it was decided to dispense with exhibits of all kinds this year, even the usual Branch exhibits will be dispensed with, much as the committee in charge dislikes this step. It was agreed that it is a logical conclusion and has the sanction of Mr. George Wagner, 2nd Vice President and Exhibits Chairman. A large display of Photographs of past conventions and other items of interest, personal and otherwise, connected with the trade will be a feature. This idea is receiving enthusiastic support. Anyone having photos of past conventions or pictures of events connected with the history of the Society should write to Chester Smith, c/o J. C. Miller Company, Grand Rapids, General Chairman of the Convention.

There will be no preprints. Short abstracts of the papers to be read will be a part of the Convention program which every member will receive.

The business session on Monday morning will not follow the usual routine. In order to conserve time, there will be no outside speakers. Other preliminaries customary in past years will be eliminated. Reports of the National officers will not be read, but will be printed and included in the report given each year by the Executive Secretary. Each delegate will receive

a copy. All members may read these reports as they will appear in the Convention Proceedings.

The distinctive features of this year's Convention will be the Educational Sessions. Realizing the deep interest in finishing information for defense purposes, the committee is busily engaged in trying to secure outstanding speakers, who will present papers on Hard Chrome Plating, Iron Deposition, Synthetic Finishing, Formulas for dipping and Pickling, Copper Plating previous to hardening, and Lead Plating, all of which are vitally necessary in the preparation of metals now being used for war purposes. The papers thus presented will not be too long in order to provide for plenty of discussion.

If the attendance at the recent annual meetings of the various branches may be used as a criterion, we may expect a great number of foremen platers, their assistants, plant superintendents, supply house representatives and technical men at the Grand Rapids Convention. Problems of the utmost importance will be discussed as never before. Whether you are a member of the A.E.S. or not, if you have a problem regarding Finishing operations, methods of procedure, costs, substitutes etc., we welcome you to our educational sessions. Bring your problem, come and discuss it with us. We too are endeavoring in this manner to be of assistance to all, in our effort to win the war.

The Educational Committee, consisting of Lyman Sperry, Maurice Caldwell and Chester Smith are busy preparing the program, which should be ready for distribution about the middle of May. Scan its pages carefully and note the type of men and their subjects. These men have knowledge and experience, furthermore they are willing to impart that knowledge to the satisfactory solutions of today's finishing problems.

Several matters of business will come up for discussion this year, such as broadening the scope of the Society to include those engaged in applying finishes other than electroplating. This will also necessitate the changing of the name of the Society from a distinctive plater's organization to an all inclusive metal finisher's association. In this connection we respectfully call your attention to Mr. C. E. Conley's article in last months REVIEW page 74.

Chromium Plating *on* Brass

Presented at Newark Branch Jan. 9, 1942.

By GEORGE WAGNER

NOT so many years ago, a Chromium Solution was one of the most difficult plating baths to operate, due to its many unusual characteristics. The current densities are high, 100 to 400 Amperes per square foot; the throwing power is low; the bright plating range is narrow; the chromic acid concentration is wide, 33 to 54 oz. per gallon; the temperature 85° to 135°F. The plater has coped with all problems, so that at the present time he finds it relatively easy to Chromium Plate any article, regardless of its construction.

Chromium Plating direct over Brass or Copper is somewhat more difficult than Chromium Plating over a Nickel deposit. The following method when carefully followed will give very good results. The brass or copper articles which have a polished surface, should be free from all polishing compounds, wiping with a soft cloth is recommended. The articles are then placed on racks. Firm contacts are essential. The outer frame of the rack should not be insulated and should act as a thieve or a dummy to prevent the parts on the outside of the rack from burning. The balance of the rack should be insulated, with the exception of the contact points. This will prevent the articles from being shaded and will offer a more even distribution of current.

The racks are immersed in an alkali cleaner for about 30 seconds without current; rinsed in cold water; immersed in a Cyanide dip of 3 to 4 oz. Sodium Cyanide per gallon; re-rinsed in cold water; then placed in the Chromium bath with the current turned on before the rack enters the bath. It is essential to make contact immediately as Brass or Copper will be attacked by the Chromic Acid within one or two seconds. The temperature of the bath should be 125° to 130° F. for bright deposits. The current density 150 to 175 Amperes per square foot. Six to ten minute deposits, depending on the type of work, are usually sufficient for commercial articles. The deposit will be from .00003 to .00005 in thickness.

Chromic Acid dissolved in water and heated to the boiling point for at least five minutes will improve the throwing power of a Chromium Solution. This method should be followed when making a new solution or when adding Chromic Acid to a bath which has been in operation.

The maintenance of the bath is very simple. The Chromic Acid concentration can be determined by the simple means of a hydrometer. A careful operator may operate a Chromium bath indefinitely without analysis by just simply adding Chromic Acid to keep the concentration of the bath within a specified operating range and by adding sulphate in the amount of 1/2 of 1% of the amount of Chromic Acid added. In other words, when adding 100 lbs. of Chromic Acid add 1/2 lb. of sulphate also. However, to be on the safe side, it is advisable to have analysis made periodically.

It is advisable to Nickel plate prior to Chromium plating irregular shaped articles which have deep recesses. Unless racks are designed with anodes pointing directly to the recessed parts, there will be very little or no deposit on the lowest part of the recess. For instance a reflector about 3″ in diameter and 2″ in depth should be plated with an anode pointing to the inside, which can be done by either having an anode rack attached to the cathode rack or by having a stationary anode rack in the bath and the cathode bar marked so that when the cathode rack is placed in position the inner anodes will also be in the right position.

The latter is the simpler way, in-as-much-as it saves removing and carrying the anode rack with each rack of work. To avoid short circuits when using this method, it is also advisable to insert a short hard rubber stud or any other insulating material at the point of the inner anode.

It is possible to plate recessed parts by means of a strike, for instance, if a 6 volt pressure is used to obtain normal current density on a specified amount of irregular shaped articles, an 8 volt pressure should be employed immediately upon the racks entering the bath, for only a few seconds, after which the current should be brought right down to the 6 volt pressure. The tem-

porary high current density permits the entire surface of the article to be covered with Chromium. Should the excess current density be applied too long, the articles will be burned at the edges.

When Chromium Plating brass pipes or brass tubing direct, it is recommended that metal plugs be inserted at each end to which the contacts can be fastened. This will permit a uniform deposit and prevent the brass on the inside from being attacked by the Chromic Acid.

Brass Castings, calling for a Chromium finish, are very often troublesome to the plater, whether Chrome plated direct or Nickel and Chromium plated. The Chromium solution oozes out of the pores after the work has been dried. Repeated rinsing in hot water does not always check this condition. A heavy Copper deposit, Acid Copper preferred, and buffing after the Copper plate, will eliminate this difficulty to a great extent. By buffing the Copper, many of the pores will be sealed and if Nickel is specified prior to Chrome, the Nickel deposit would have better adherence to the Copper than to the Brass.

A practical formula for Chrome Plating direct on Brass or Copper is 50 oz. Chromic Acid and 1 1/2 oz. Zinc Sulphate to each gallon of water. This will register 30 Bé on the Hydrometer.

The tank should be lead lined and the anodes of Antimonial Lead composition. Steam or hot water jacketed tanks are best for heating purposes, although chemically pure lead coils can be used.

ANNUAL MEETINGS

Boston—March 28
Newark—April 11
Rochester, Buffalo at Rochester—April 18
New England Regional at Springfield, Mass.—April 25
Milwaukee—April 25

Los Angeles Branch has decided to hold its Annual Educational Session and Dinner on March 21, 1942 at the Los Angeles Breakfast Club.

Last month's article on "Cadmium Plating for Aircrafts" by W. F. Hodecker Jr., was read at a recent meeting of Newark Branch of which Mr. Hodecker is an active member.

The Fundamentals of Electrochemistry and Electrodeposition

VII. The Ionization of Water and the Significance of pH

The Ionization of Water

By SAMUEL GLASSTONE
Ph. D., D. Sc.
Frick Chemical Laboratory
Princeton, N. J.

IT is well known that water is a poor conductor of electricity, and that the presence of certain impurities, particularly salts, acids and bases, increases the conductance. Nevertheless, even the purest water has a definite, although very small, conductivity which is a property of the water itself and not of the impurities. This fact was established some fifty years ago by Kohlrausch, who re-distilled water forty-two times in a vacuum and found that the resulting liquid — the purest water ever obtained — still had a detectable electrical conductance. The existence of such a conductivity means that even the purest water contains a number of ions; it is true that the number is small, but the important point is that the ions are present, and consequently they must arise from the ionization of the water itself. The only ions, which seem reasonable, that can be produced from pure water are the hydrogen and hydroxyl ions, and so it is natural to suppose that water ionizes to a small, but nevertheless definite, extent into these ions. It was seen in Part II (September, 1941)that the hydrogen ion in aqueous solution is really to be represented by H_3O^+, and since the hydroxyl ion is OH^-, the self-ionization equilibrium of water may be represented as $H_2O + H_2O \rightleftarrows H_3O^+ + OH^-$. This equilibrium is of considerable interest from many points of view, but here we shall restrict ourselves to the consideration of those aspects of the subject that have a direct bearing on electroplating problems. While emphasizing again that the hydrogen ion is H_3O^+, it is nevertheless convenient, for simplicity, to represent it by the

symbol H^+, it being clearly understood that this is just to save ourselves the trouble of writing the slightly more complicated formula. Bearing this in mind, we can write the equation for the self-ionization of water as $H_2O \rightleftarrows H^+ + OH^-$.

The Ionic Product

Since the conductivity of pure water is low, as mentioned above, the extent of self-ionization is small, so that the position of the equilibrium considered in the previous paragraph must lie well to the left, i.e., on the side of the un-ionized (or undissociated) water molecules. However, whatever the actual state of the equilibrium, the application of the important law of physical chemistry, known as the "law of mass action," leads to the conclusion that the *product of the concentrations* of the hydrogen and hydroxyl ions in water is a constant.* This conclusion may be represented by means of a simple formula in the following manner. It is the common custom to use square brackets as a symbol for concentration, so that the quantity $[H^+]$ would be interpreted as the "concentration of hydrogen ions"; similarly, $[OH^-]$ means the "concentration of hydroxyl ions." Hence, the result derived above from the law of mass action may be written as $[H^+] \times [OH^-] = \text{constant}$. The consequences of this equation are of great importance in electrochemistry. Although it has been derived from a consideration of the ionization equilibrium in pure water, the general conclusion must hold for *all aqueous solutions*. This is true, irrespective of whether we are dealing with pure water, which is rarely the case, or whether the water contains a salt, acid or alkali in solution. The value of the constant, frequently known, for obvious reasons, as the *ionic product* of water, depends on the temperature. Under ordinary conditions, that is at 22°C. or 72°F., it is very close to 10^{-14}, with the concentrations of the ions expressed in gram-equivalents per liter. Although the magnitude of the ionic product increases somewhat as the temperature is raised, it is sufficiently exact, for most purposes, to adopt the value just given.

*Strickly speaking "activities" should be used instead of "concentrations" but this refinement need not concern us here.

Neutral, Acid and Alkaline Solutions

Since the dissociation of a molecule of water produces one hydrogen and one hydroxyl ion, it is evident that in pure water the amounts of these two ions must be equal. Any solution for which this condition holds, i.e., $[H^+] = [OH^-]$, is said to be *neutral* in reaction. It can be readily seen that in these circumstances, since the ionic product is equal to 10^{-14}, the concentrations of hydrogen and hydroxyl ions must both be 10^{-7}; thus, $[H^+] = [OH^-] = 10^{-7}$ g. equiv. per liter in a neutral solution at ordinary temperatures. If an acidic substance is added to the water, the concentration of hydrogen ions is increased (see Part III, October 1941) and the value must exceed that in pure water or in a neutral solution. In other words, we can say that for an acid solution $[H^+]$ is greater than 10^{-7} g. equiv. per liter. This is, therefore, how we can define an *acid solution*: it is one in which the hydrogen ion concentration is more than 10^{-7} g. equiv. per liter; the hydroxyl ion concentration is less than this amount since the product remains constant at 10^{-14}. The more acid the solution the greater is the concentration of hydrogen ions and the smaller that of hydroxyl ions. In a "normal" solution of hydrochloric acid, for example, the value of $[H^+]$ is about 1 g. equiv. per liter, and hence that of $[OH^-]$ is about 10^{-14}. On the other hand, an *alkaline solution* is one in which the *hydroxyl ion* concentration is more than 10^{-7} and hence the hydrogen ion concentration must be less than 10^{-7} g. equiv. per liter. We thus have a convenient scale of reference for representing acidity, alkalinity and neutrality in terms of hydrogen ion concentrations.

The Significance of pH

Since hydrogen ion concentrations are generally small in amount, except in highly acid solutions, they have to be represented by means of negative exponents, such as in 5×10^{-4}, 7.2×10^{-6}, 3.16×10^{-9}, to quote three examples at random. In order to avoid this, an alternative scheme, based on the use of "pH" is often employed. For our purpose the quantity pH may be defined as the *negative logarithm of the hydrogen ion concentration of the solution*, i.e., $pH = -\log [H^+]$. Let us consider

the solutions just referred to; in the first, the hydrogen ion concentration is supposed to be 5×10^{-4} g. equiv. per liter, and if we look up in the tables we find the logarithm to be -3.30, and hence the pH of the solution is 3.30. Similarly, it is readily found that a hydrogen concentration of 7.2×10^{-6} corresponds to pH 5.14, while 3.16×10^{-9} g. equiv. per liter is equivalent to pH 8.50. It will be noted, from a comparison of these three results, which are for solutions of decreasing hydrogen ion concentration, that as the hydrogen ion concentration diminishes the pH *increases*. This important point should be borne in mind; it is the result of defining the pH, for convenience, in terms of a *negative* logarithm.

Returning now to a consideration of a neutral solution, it is seen that since $[H^+]$ is 10^{-7}, the pH value must be 7.0 at normal temperatures. Further, in an acid solution the hydrogen ion concentration is greater than 10^{-7}, and hence, from what has been said, it is apparent that the pH must be less than 7.0. Similarly, an alkaline solution is one in which the pH is greater than 7.0. We are now in a position to draw up a simple table to represent our general conclusions:

	Acid Solution	Neutral	Alkaline Solution
$[H^+]$	Greater than 10^{-7}	10^{-7}	Less than 10^{-7}
pH	Less than 7.0	7.0	Greater than 7.0

The stronger the acid the smaller the pH of the solution; if we consider moderately concentrated solutions, say 0.1 to 1.0 g. equiv. per liter, of various acids, the strong mineral acids, such as hydrochloric and sulfuric acids, will give pH values of 0 to 1; solutions of weak organic acids, such as acetic acid, have a pH of about 3; while still weaker acids, such as boric acid, will give a pH of 5 or so. However, as long as the pH is less than 7.0, the solution is to be regarded as acid; the more highly acidic, the smaller the pH. In a strongly alkaline solution the pH may rise as high as 14, while in moderately alkaline systems, such as are obtained with cyanides or with ammonia, the pH is in the vicinity of 11. Any solution whose pH is more than 7.0 is alkaline in reaction, and the more this value is exceeded the greater is the alkalinity.

SILVER

By F. K. SAVAGE
Connecticut Instrument Co.

Read at Chicago Branch meeting
January 9, 1942.

SILVER has held an intriguing fascination for man from the early dawn of history. Its patrician beauty, durability, workability and reflectivity has always ranked it as one of the earth's most precious metals. Its use by men in ornaments, containers and tableware goes back as far as we can trace the history of civilization itself.

Excavations in Egypt have shown, according to the estimation of archaeologists, that the craft of silversmithing dates back to about 2500 B.C. Through the ages silver has left its mark on the trend of civilization and so far reaching has been its influence that it is even used in our common speech, as seen by the expressions, 'silvery moonlight,' 'silvery music,' 'the cloud with a silver lining,' and 'silver tongued orator,' something your speaker definitely is not. ([1]) That the ancients made a good choice of a material for utensils and tableware is proved by the fact that it is still the most popular tableware in solid and plated forms, in spite of the claims of the stainless advocates.

Silver is found widely scattered throughout the civilized world. One of the oldest mines is in the town of Attica near Athens. It is known that this mine was worked before 600 B.C. The Romans worked silver mines in Spain during their occupation. Mines were worked in the British Isles before the Romans came. Mexico has been a large producer of silver since Spanish conquest. Utah, Montana, Idaho, Arizona, Colorado and Nevada are the outstanding silver producing states in this country. The largest single vein ever discovered is the Comstock lode of Nevada. Silver occurs free from other metals but usually is found with lead, zinc, copper or gold. Most of the silver produced now is in conjunction with the mining of other metals. The enormous increase in the use of metals occurring with silver has made it recently more plentiful than before. In 1940 there was produced 41,000,000 Oz. T. or a 20% increase over 1939. The nation has long been concerned with this oversupply of silver. In fact, there is at present an enormous stock of the metal. This leads us to the conclusion that here is one metal

we may safely use as freely as we can without fear of a shortage.

Silver was first plated about the year 1842. Its principal use has been, until comparatively recently, in flat tableware, hollow ware, jewelry, band and orchestra instruments, trophy cups and novelties. In comparison to plating methods for such metals as nickel, zinc, and cadmium, there has been little advancement in the methods of its deposition. Mesle([2]) has made several worthwhile and level-headed contributions. Egeberg and Promisel([3]) have published several papers on silverplating and taken out at least one patent,([4]) on bright silver. Wood([5]) in proposing a modification of the conventional solution by the use of nitrates did the silverplating industry a most excellent service. Savage and Pfefferle([6]) substantiated Wood's finding in a recent report on automatic silver plating. There are other references on silver plating in the literature([7]) which are invaluable to those interested in this phase of electrodeposition. The chapter in "The Principles of Electroplating and Electroforming," by Blum and Hogaboom is an excellent resume of conventional formulae and operating conditions.

The recent shortage of strategic metals and the more recent terrific demand upon the ingenuity of Americans to produce better war materials faster than our enemies, has turned attention sharply to silver. The interest is divided into two general groups. Those who wish a finish to replace copper, nickel and chromium, zinc or cadmium in non-defense uses and those who employ silver to build better war machines. Electroplaters are interested in both uses. The non-defense uses wherein the possibility of silver successfully and economically replacing nickel and chromium plate was discussed very ably by Bregman([8]) in a recent issue of "Iron Age." The following data was presented: Silver costs roughly $5.10 per pound av. In plating nickel the cost to cover a square foot of area is about 1/2¢ per .0002" thickness. Silver costs 5 1/2¢ for the same area. The labor costs are roughly comparative. The protection to the base metal is good. The appearance of the outside in many cases is superior and justifies a higher price. I might call your attention to a special isolated case where, in the manufacture of band instruments, the overall cost of nickel and chrome finishing a bugle, for instance, is much higher than the overall cost of finishing the same piece in a much more pleasing silver finish.

The defense uses of silver have so far been principally in bearings, electrical contacts, reflectors and other special applications. In the interests of the defense effort many of the details of the defense uses cannot be discussed in open meeting. It seems more fitting and far safer for us to do what we can to use a readily available metal in non-defense uses in preference to some of the less available metals even provided that we can get them.

I would like to discuss a few of the things which must be watched in order to successfully deposit silver on the ordinary base metals. Silver has, by virtue of its position next to gold in the electromotive series, a decided tendency to deposit by immersion on most other metals. Copper and copper base alloys such as brass and bronze may be plated with silver by using a series of two or three silver strikes starting with one low in silver and high in cyanide. Silver has less tendency to deposit by immersion from a dilute bath in which the ionization of the silver is repressed by a high cyanide content. The current on the initial strike should be high and the contact made as soon as possible. Copper and its alloys may also be plated with silver after "blue dipping" or mercury dipping. The resultant mercury high alloy at the surface is less susceptible to immersion plating than is the untreated metal. One silver strike after this treatment is sufficient if care is used although two are better. One of the best ways of plating copper or copper alloys with silver is to first apply a thin layer of nickel over which silver has little or no tendency to deposit by immersion. It is essential that the work be exposed to the air as little as possible between the nickel and the single silver strike solution used in this case. A long exposure often results in slight oxidation of the nickel surface and poorly adherent deposits.

Silver may be successfully plated over nickel and its alloys with the use of a single strike solution as explained above.

Recently I have seen silver successfully plated on zinc alloy diecastings after an intermediate layer of iron had been applied. The adhesion was excellent. The iron solution was only slightly acid and of the ferrous ammonium sulphate type. There are two interesting side lights in this process. First, it is claimed that a preliminary strike is not needed to plate silver over electrolytic iron obtained in this way. The second point is that even though electrolytic iron rusts very rapidly over most base

metals it does not so rapidly over zinc. It then seems that zinc has a protective value for iron when it is either under or over it.

Probably the greatest interest at present in silver plating is when applied over steel. This may be successfully done over either a copper or nickel undercoat. Steel may also be plated with silver direct by using a series of at least three strike solutions. A low copper content is often used in the first strike. The amount of silver necessary to give a pore free deposit is dependent upon the condition of the base metal, the method of applying the silver, and the thickness of the silver. Bergman showed that under the proper conditions as little plate as .0001 inch gave a coating which was pore free over a copper undercoating. Recently it came to my attention that it is possible to deposit extremely adherent coatings of silver upon steel which has been previously treated to produce a phosphate coating. Such coatings have long been used as an undercoat for paint and similar finishes. It does not seem to be necessary to use any strike solution. If the proper operating conditions are used to treat and plate the steel the corrosion resistance seems to be greater than with silver alone. This process is of great interest due to the fact that none of the strategic metals now on priority are used.

In certain instances it is desirable, due either to great availability or to the intended use, to apply electrodeposits to non-metallic articles such as plastics. Silver is being used in increasing quantities to render the surface of the non-metallic article conductive. The article is dipped into, or sprayed with, a solution of silver salt. It is then treated with a reducing agent which deposits metallic silver uniformly and adherently over the surface. The article may then be plated with any desired metal.([9])

Silver plate unprotected is very susceptible to sulphide tarnishing which renders it unsightly in a very short time. In many cases it is desirable to protect the silver either to prevent tarnishing or to afford additional protection to the base metal or both. In some applications silver need not be protected. Silverware is an outstanding example. Electrical contacts rarely are protected as the sulphide film is a good electrical conductor. Where protection is desired, clear lacquer or clear synthetic enamel serves very well for mild use. It is possible to induce the

formation of colorless chromate or chromite films over the silver which protect it very well against tarnish provided there is no abrasion. Beryllium hydrate films may be electrodeposited on silver and baked to berryllium oxide.([10]) These films inhibit tarnishing very well but they are extremely thin and must be subject to very little abrasion in use. A great deal of interest has been evidenced in the possibility of using silver for an undercoating for chromium. There are several obvious drawbacks to such a process, but I understand that there have been indications which are promising.

Indium promises to be a good overcoating for silver where the cost will permit. This metal, when applied over silver and subsequently baked, produces an indium silver alloy which is between silver and chromium in color and is very resistant to corrosion. The film will stand considerable abrasion. Indium is a very expensive metal but extremely small amounts are used.

In concluding, I do not wish to leave you with the impression that I am advocating silver as a cure-all for all of your plating problems. I do feel, however, that is has many possibilities that have not yet been considered and that we should consider its more general use from an unprejudiced viewpoint.

([1]) The Story of Sterling published by The Sterling Silversmiths Guild of America.

([2]) A Resume of Silver Plating. F. C. Mesle, THE MONTHLY REVIEW, October, 1937.

([3]) The Silver Plating of Hollow Ware. E. G. Egeberg and N. E. Promisel, *Products Finishing*, April, 1937.
Brighteners in Silver Solutions, E. G. Egeberg and N. E. Promisel, *Trans. Elec. Chem.* Vol. LXXIV.
A Study of Silver Plating Solutions, E. G. Egeberg and N. E. Promisel, *Trans. Elec. Chem.* Vol. LIX.

([4]) Bright Silver, Pat. No. 2,176,668, E. G. Egeberg and N. E. Promisel.

([5]) Something New in Silver Plating, Donald Wood, THE MONTHLY REVIEW, 1938, *Metal Industry*, April, 1938.

([6]) A Development in Full Automatic Silver Plating, F. K. Savage and P. R. Pfefferle, THE MONTHLY REVIEW, February, 1941.

([7]) Experiments on Electroplating Bright Silver, Robert Weiner, THE MONTHLY REVIEW, June, 1940.
The Electrodeposition of Gold and Silver. F. C. Frary, *Trans. Elec. Chem.* Vol. XXIII.
Bright Silver Plating from the Cyanide Bath, L. C. Pan, *Trans. Elec. Chem.* Vol. LIX.
Silver Plating Baths Containing Amines, Gilbertson and Mathers, *Metal Finishing*, May, 1941.
Variables in Silver Plating Solutions, A. E. Nicol, *Metal Industry* (London) March, 1940.

(*Continued on next page*)

(8) Silver to Replate Nickel and Chromium Plate, A. Bergman, *Iron Age*, November, 1920.
(9) Silver Coatings on Non-Metallic Surfaces, J. R. I. Hepburn, *Metal Finishing*, November, 1941.
(10) Protection of Silver by Electrolytic Deposition of Beryllia, Price and Thomas, THE MONTHLY REVIEW, June, 1940.
The Cathodic Treatment of Copper in a Solution of Beryllium Sulphate to Prevent Tarnishing. Ewing and Jernstedt. *Trans. A. E. S.* 1940.

BLACKOUT BULB

Designed for blackout lighting in air raids, the new Wabash Blackout bulb just announced by the Wabash Appliance Corporation, Brooklyn, N. Y., provides downlighting in a soft beam of blue light that is safe for indoor visibility during blackouts. The bulb is lined inside with a pure silver reflector lining that hides all filament glare and projects the light downward. Light leaks are prevented by a black silicate coating that covers the bulb up to the extreme lighting end which is a deep blue.

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10 RULES TO MAKE TIRES LAST

From *Victory*, Dec. 23, 1941

Inaugurating a Nation-wide rubber conservation campaign ,the Office of Production Management today called upon the country's 27 million car owners to observe 10 rules to make tires last longer.

1. *Have worn tires retreaded instead of buying new ones.*—Cost of retreading tires is usually about half that of a new tire, and will give you about 80 percent as much wear.
2. *Cut out high speeds.*—Your tires will last twice as long at 40 miles per hour as at 60 miles per hour.
3. *Inflate tires weekly to recommended levels.*—Never let pressure fall more than 3 pounds below recommended minimums.
4. *Don't stop short or make jackrabbit starts.*—Every time you ignore this rule you burn up the tread.
5. *Avoid striking curbs, road holes, rocks, etc.*—This can result in broken cords or blowouts. Drive slowly and carefully over paved roads.
6. *Check wheel alignment twice a year.*—Misalignment causes scuffing and uneven wear. A tire a half inch out of line will be dragged sidewise 87 feet every mile.
7. *Repair all cuts, leaks, breaks, promptly.*—Delay may cause damage that can't be repaired. Breaks and cuts should be vulcanized whenever possible; blowout patches should only be temporary.
8. *Change wheel positions every 5,000 miles.*
9. *Always get the tire made to fit the rim of your car.*
10. *Don't speed around curves.*

Relative Costs *of* High Speed Bright Plating *versus* Old Style Plating

Presented to the A. E. S. meeting of December 10, 1941.

By DON BEDWELL

President, Los Angeles Branch
American Electroplaters' Society

THIS is a rather inopportune time to be discussing the relative costs of various methods of doing electroplating. The main theme these days is: First, getting the job to plate, and second, getting the necessary metal to plate it with; and unless you happen to be one of those "lucky" fellows who is working on "defense" work, you are out on the limb already. At any rate, we can all hope for the best and plan for the future. Most all of you "old timers" have weathered worse storms than this.

Auditing Old Style and New High Speed Bright Plating Processes

Well, getting back to our subject of relative costs, these may not be exactly the right words. As some of you will remember, some ten or twelve years ago when we were all doing plating the old trial and error way, we had an auditor audit a group of our shops from the largest to the smallest, and from the results obtained it would seem that **our** costs were many and varied,—running all the way from $1.00 an hour to over $3.00 an hour per man.

Now that many of you are using the new high speed bright plating processes, I would venture to say that an audit of several shops would show many different costs for the same type of work. However, this is not fatal. There are a lot of different ways of "skinning any cat".

Many of you who have not used the new "bright plating processes" may have an idea that you have to do more polishing, have more cleaning tanks, etc., but I assure you that this is not the case. You do have to change your methods of cleaning slightly but these changes are not complicated or long winded.

Rigid Control of New Electrolytes

Next, the control of the plating solutions—and this is something you must do if you want results. You have plenty of assistance along these lines from the firms who sell these high speed processes—and it doesn't take you long to get "on the beam".

Changeover of Chemicals, Anodes and Equipment

Next, the salts and anodes you use don't cost any more than the salts and anodes you use in your present setup—you just use more of them—and how!—plus brighteners, wetting agents, rubber lined steel tanks, immersion heaters, adequate buss bars, rheostats, and tank rod equipment necessary to carry the extra current used in this process.

Changeover Methods of Cleaning and Rinsing

An adequate soak cleaner and one that will not tarnish the work is required. The manufacturers of cleaning compounds have developed cleaners to cope with the more exacting requirements of bright plating. As far as your acid dips are concerned, they are no different than what you have been using all along. The main point is that the acid must be *fresh* and *clean*. Of paramount importance is the rinsing. The final rinse water must be perfectly clean at all times and this is best accomplished by the use of a spray rinse.

The Job Shop Compared with the Manufacturer

For the manufacturer, of course, it is more simple than for the job plater. He, the manufacturer, makes racks to fit every different piece of work, while the job plater constantly finds himself confronted with different shapes and sizes of work for which he can't afford to make racks. But wasn't it always that way?

Next, if I were running a job shop, I would not throw out my old style nickel or duplex copper. Why? I can think of lots of jobs I have had in my job shop that I would want not to put into a bright nickel or high speed copper tank. But in the same breath, I can't see how a job shop can afford to be without these high speed bright plating solutions. You are really out of the running when it comes to a production job, if you don't have them—even though you do give your customer more for his

money. And right here is the point—just because you get three to five times as much work through the same sized tank, don't think you are getting away with anything, because that tank is burning lots of oats!—as you will soon find out when you filter and replace anodes.

Rate of Deposition of Metals Compared

Let us now examine some actual figures to prove a point or two:

1. **Copper**

Let us assume that a particular job requires .0003" copper, then the times and current required for various solutions are:

Acid Copper	97% Efficiency
Plate thickness	Time:
.0003" thick	13.1 min. agitated — 25 amp.
	32.6 " still — 10 amp.
Cyanide Copper	60% Efficiency
Plate thickness	Time:
.0003" thick	17.4 min hot — agitated — 15 amp.
	26.2 " cold — still — 10 amp.
	37.4 " cold — still — 7 amp.
High Speed Bright	100% Efficiency
Plate thickness	Time:
.0003" thick	6.3 min. hot — 25 amp.

The Rochelle copper bath (50-70% efficiency) will plate just about as fast as this high speed copper, though with an increased current density, owing to a lower efficiency of the bath. It produces a very good deposit, but it is a bit temperamental in its bright range, as most of you will agree.

Now let us consider nickel plating:

1. **Still Nickel Old Type** 92½% Efficiency

Plate thickness	Time:
.0003" thick	44.7 min.—8 amp.
	23.9 " — agitated — 15 amp.

2. **Hot Watts** solution properly balanced deposits same as bright nickel 98% Efficiency.

3. **Bright Nickel**	98% Efficiency	
Plate thickness	Time:	
.0003" thick	13.8 min.	— 25 amp.
	11.6 "	— 30 "
	8.7 "	— 40 "

You may find many jobs that you can run at a higher current density and thereby plate faster with these new baths, but I think that these I have given are a fair average.

It would appear, then, that you could get from 3 to 5 times as much work through the same sized tanks in a given period.

Simplified Procedure

Now then, in the old method, after plating, you had to dry the work and take it to the "color" man, whereas with this method you transfer it to your chrome racks (wet) and chrome plate. After it is chrome plated, your color man can "wipe" it in half the time that he could have colored the "dull nickel", in which case he would still have to "wipe" the chrome.

Conclusion

Now, if you are doing process or die castings, I will let you draw your own conclusions as to your saving from these observations, but if you are doing steel, neither a bright copper nor bright nickel will obliterate polishing lines or imperfections. They will either have to be buffed out of the copper or out of the nickel—and who can afford to put that much nickel on now? Your duplex or Rochelle copper is just as good as any in this case, followed by bright nickel.

MOTOR DRIVEN OBLIQUE PLATING BARREL

A new and improved oblique plating barrel drive has been developed by the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies. This Type 34 X oblique barrel is now available in a new model, directly driven by a 1/6 HP motorized worm gear reducer which is suitably mounted on the tank, ready for connection to the user's power lines. The arrangement readily permits the removal of the cylinder for rinsing, loading and unloading of the work.

This barrel can be furnished with a wooden tank, asphalt lined; or a steel tank, unlined or lined with 3/16" vulcanized rubber. The cylinder is all of bakelite construction with disc or button type contacts; or of hard rubber with disc type contact only. The panels in the bakelite cylinder are 1/8" thick; in the hard rubber cylinder, 1/4" thick. This unit will handle about 25 lbs. of work per batch.

The same type of drive may be applied to other units made by the Hanson-Van Winkle-Munning Company, in sizes down to 10 lbs. of work per batch.

Linings *for* Tanks *in the* Plating Shop

By EARL COFFIN

Read at Los Angeles Branch Meeting
Jan. 10, 1942

A FEW years ago most plating tanks were of wood and were lined only to prevent them from leaking or to protect the wood from the corrosive action of the solution. But since the advent of heated, high speed solutions, various other types of tanks have become necessary. In many cases it is necessary for the tank lining to not only protect the tank from the solution but to protect the solution from becoming contaminated by the material from which the tank is made.

In studying the type of tank suitable for each solution in a plating shop I have divided the solutions into three groups: Cleaners, pickling solutions and plating solutions. I have subdivided cleaning solutions into two classes: Alkaline cleaners and degreasers.

Alkaline cleaners used either with or without electric current can be operated very satisfactorily in plain steel tanks. Steel is affected very little by the solutions and a steel tank is the easiest type to heat.

I have found that where current is employed, it is better to use a nickel coated steel anode rather than use the tank itself as an anode. Nickel plated anodes do not seem to become coated with a nonconducting coating as readily as do plain steel ones.

This leads me to believe that some of the nickel steel alloys or nickel clad steels might make good cleaner tanks where the tank itself is to be used as an anode. I'll admit that with the nickel situation as it is at present this suggestion is rather pointless.

For degreasers nothing has been found to be better than heavily galvanized steel. Electro-plated or hot sprayed zinc coatings are not as satisfactory as hot dipped galvanizing. A plain steel tank is not satisfactory at all. The degreasing solvent attacks it too readily.

For ordinary cold pickling solutions made with sulphuric or muriatic acid and not highly concentrated, it is quite practical to use unlined wooden tanks made of spruce or yellow pine. It is common practice, however, to line them with asphaltum tank

lining, more to prevent leakage at the joints than for any other reason.

For a hot sulphuric acid pickling solution, either lead or rubber makes a good lining. A new type of lining that is gaining a great deal of favor is acid-proof brick. It seems to be an ideal lining for a pickling tank if the treasury will stand the jolt of the initial cost. For small pickling solutions acid-proof crocks are almost universally used.

Plating solutions can be readily divided into two groups, acid and alkaline. The most common acid solutions are nickel, acid copper and chromium. For cold nickel solutions, wooden tanks, either unlined or lined with asphalt tank lining, have proved quite satisfactory, and because of their low cost they will probably be used for a long time. But they are only fairly satisfactory for acid-copper and are not at all suitable for bright nickel or chromium. Bright nickel is a case where the solution not only ruins the tank but the tank ruins the solution. Rubber lined steel tanks are used extensively for bright nickel, but I believe that as time goes on acid-proof brick will become more and more popular. Plain Steel tanks are not suitable for any nickel solution as all nickel solutions contain chloride of some sort and all chlorides attack steel. Lead has been used for cold nickel solutions but it is not entirely satisfactory. It tends to contaminate the solution.

For acid copper solutions lead lining is quite satisfactory. Acid copper solutions have been operated in wooden tanks lined with asphalt tank lining, but that is not very satisfactory for if the lining should become cracked or punctured the tank itself doesn't last long. Rubber or acid-proof brick do very well for acid copper.

Chromium solutions have been operated in unlined steel tanks, but this is not the best practice. Steel dissolves in the solution, eventually ruining both tank and solution. Lead has always been considered standard lining for chromium tanks. The lead is usually strengthened by being alloyed with a small percentage of antimony, tin or tellurium. Acid-proof brick has also been found satisfactory. Rubber is entirely unsatisfactory for chromium tanks. However, recent developments seem to indicate that we may some day have a chromium tank lining made from one of the so-called "synthetic rubbers."

The common alkaline plating solutions are cyanide copper, cadmium, silver, gold, zinc, brass and tin. In general, where the pH of a solution is between 8 and 13 and the solution contains no chloride, it can be operated in an unlined steel tank. This is true of cyanide copper, cadmium, zinc, tin and some brass solutions. Some brass solutions contain chloride and this makes steel tanks unsuitable. Silver has a tendency to deposit on steel by immersion so a silver tank should be lined. Asphalt will do, but it is not the best. Rubber or synthetic rubber is much better. Small solutions of silver and gold are usually kept in porcelain lined tanks. Lead is not good for any cyanide solution. In the vernacular of the plater it "poisons" the solution. Imagine "poisoning" a solution that already contains cyanide!

In summarizing, remember that all linings of the same substance are not necessarily the same quality. So when a plater tells you that he got poor results for a rubber lining or a synthetic lining or a brick lining, don't conclude immediately that these substances are no good. In one plant here in Los Angeles there are rubber lined tanks that have been in use for years and are still good, and this plant has had other rubber lined tanks that lasted only a few months under exactly the same conditions. A tank lining, like a plated coating may be good or bad depending on how it is put on.

Then too, remember that electricity can play queer tricks on a metal tank or metal lining. A tank may be entirely impervious to the action of a solution as long as no electricity is applied to it but when current is applied an action may start immediately. And the current does not have to come from a direct connection to the generator. It may be current from the anodes through the solution or from contact with a gas pipe that has been used as a ground for some electrical machine somewhere in the shop, or just through a wet floor on which the tank is resting, or a hundred and one other places that would tax the detective powers of Sherlock Holmes to discover and eliminate. For this reason wherever it is practical to line a tank with something that will not conduct electricity it is advisable to do so, and where the tank or lining must be made of metal every precaution should be taken to insulate and isolate it from every source of electric current except the one you want.

Conservation

It would be a difficult problem to estimate the amount of metal that has been lost through drag-out from plating solutions; or, that lost through acid pickles and bright dips. If a guess were to be made it would be for the entire plating trade a loss that would run well into the hundreds of tons for a short period e.g. since World War I.

That, along with the metals lost, either partially or completely from plating racks or slinging wires would be at this time a distinct help in war production.

While it is "water over the dam," it is not necessary to continue these losses and as platers and members of the A.E.S., who are making every effort to assist in winning this war, it is up to us to learn how to overcome this actual waste of strategic metals.

This is a war of metals. Any amount, regardless of how small, that can be saved means so much more for defense. With the reduction in the amount of electroplating there is the time to study the problem of recovery of metals from rinse water, acid dips, racks, and in every place possible. We will not only be doing a much needed service for the present situation, but would be increasing our efficiency as platers for future work.

Do not think for even a moment that plating is not coming back. It is and in greater volume than ever before. Never in the history of electroplating has the public become so well acquainted with the word "plating." It is as common in newspapers as it was last year in trade journals devoted to electroplating and finishing of metals. The value of plating is being recognized as evidenced by the number of specifications for defense products that are now in force.

When the automobiles appear without ornamented trim and are compared in retrospect with the attractive chromium finish now on every car, will there not be a reaction when times are normal? A few years ago one manufacturer of automobiles did away with practically all electroplated trim on their cars. Milady, upon being asked what she thought of the car, replied, "I can ride in a hearse when dead."

This same trend will be in all articles that are being replaced with plastics and dull finishes. Electroplating will be recognized more than ever. It is, therefore, for the benefit of ourselves as platers and for the honor of the industry, to which many have devoted our lives, to, in these times, search and find methods to do not only better but more economical plating.

This can be done by starting now to conserve every amount of metal we can. Our reward will be in adding our constructive assistance in meeting the need for metal for defense materials and also to preparing ourselves to be better and more efficient platers and members of the A.E.S.

GEORGE B. HOGABOOM,
Principal Consultant Electroplating
Conservation and Substitution Branch,
Bureau of Industrial Conservation,
War Production Board.

Supplies and Defense

By W. D. STARR

The Lea Mfg. Co.
Waterbury, Conn.

THE new War Production Board has taken over the work of SPAB and OPM. WPB will set the course for all war production with the priorities system in charge of the Division of Industry Operations, Bureau of Priorities. Existing regulations still hold.

Priorities Regulation No. 3 establishes simplified forms and procedures for making preference rating applications and for extending ratings. Important inventory regulations are included and this is basic information for anyone involved in procurement of defense supplies.

Passenger car production was stopped as of February 1st, which definitely halts some of our largest scale plating operations. Supplies normally going to the automobile industry will go to defense consumers.

During January the supply of Chromic Acid eased noticeably. No explanation is at hand, but it has been suggested that domestic low grade ore may be a potential source to offset lack of crude material formerly obtained from the Pacific war zone.

New conservation orders issued during January restrict sharply the use of certain metals commonly used by the plating industry. For example:—

Cadmium is severely restricted by Conservation Order M-65-a which lists only six permissible non-defense general uses. This will release a needed supply for plating airplane parts, instruments and ammunition can locks.

Nickel for non-essential uses is drastically curtailed until April 1, 1942 and prohibited thereafter by Order M-6-b. Prohibited items are listed. Supply is tightening and some orders with comparatively high ratings are being rejected by allocation officials where they feel that Nickel might be substituted or eliminated.

Lead is now under Conservation Order M-38-c which lists many prohibited and a few permitted uses including anodes.

Aluminum is restricted more than previously by M-1-e with only a few important civilian uses permitted.

Our January contribution, referring to burlap, advised, "Keep used bags in circulation". Comments received were duly appreciated and we still think the advice is sound.

NEW INFORMATION

A 24-page booklet published by J. J. Siefen Co., 5657 Lauderdale, Detroit, dealing with "Nuglu" for setting up polishing wheels, belts, discs, etc., can be had by writing the above company.

Much valuable information regarding polishing wheels on the various metals is contained in the book.

Here and There

ANNUAL MEETING OF GRAND RAPIDS BRANCH

Grand Rapids, the city that will entertain this year's Convention, conducted its fifth annual Educational Session and Banquet on Saturday, January 17, at the Pantlind Hotel, which will be the Convention headquarters in June.

Robert M. Wagner, of the Guide Lamp Company, Anderson, Indiana, was Chairman of the Educational Session. He was introduced by Maurice Caldwell, President of Grand Rapids Branch.

The first speaker was Frank K. Savage of C. G. Conn Ltd., Elkhart, Indiana. His subject was "Useful Applications of Bi-Polarity in Practical Plating." The second speaker was Dr. Guy C. Given, who chose for his topic "Modern Organic Finishing." Dr. Given is connected with the E. I. duPont deNemours Company.

Walter Pinner of the General Spring and Bumper Division of the Handaille Hershey Corportaion, and W. M. Phillips of the General Motors Corp. presented a joint paper on "Modern Electroplating with Acid Copper." This paper brought to a successful conclusion one of the best and most interesting sessions we have ever attended. About 150 persons listened with close attention and discussed the various points stressed by each speaker. Many favorable comments were heard regarding the timeliness of the papers read and the understandable way they were delivered.

While preparations for the banquet were being made, there was much discussion among the members and friends regarding current events as they relate to the Plating Industry. The consensus of opinion seemed to be that electroplating will eventually come back stronger than ever, because people will tire of the cheap dull finishes now being placed on the market as substitutes for nickel and chrome.

At 7:00 the Grand Ballroom was thrown open and 391 persons sat down to a dinner of roast turkey. We cannot refrain from saying that the meal itself and the splendid service rendered by the hotel management augurs well for a successful banquet to close the 1942 Convention on June 10.

The entertainment was also a treat. There was dancing, singing and a strong man act that took one's breath away. Chester Smith, who had charge of this part of the program introduced a gentleman from Russia, who was supposed to be in this country studying electroplating. He turned out to be a poet however, and entertained us for an hour with poetry which he composed as he stood at the mike from names given to him by the audience, such as Pearl Harbor, Hitler, Mussolini, Lydia Pinkham, etc. That Russian was good.

There was a meeting of the Convention Committee with the members of the Executive Board who were present consisting of Messers Conley, Caldwell and the Executive Secretary.

Our thanks are due to the Pantlind Hotel Management for their hospitality and particularly to Mr. Burnett, of the Convention Bureau.

Friends visiting Grand Rapids from the East will be pleased with the warm hearted reception they will receive. Mrs. J. C. Miller is Chairman of the ladies committee and will do all in her power to make the visiting ladies feel at home.

We like the programs. The Grand Rapids Committee decided to solicit contributions instead of asking for ads. The result was a complete success.

The committee in charge of the Educational Session and Banquet was as follows: Messers Caldwell, Smith, Pace, Morton, Werft, Abel, and Morton.

CHICAGO BRANCH ANNUAL MEETING

The thirteenth annual Educational Session of Chicago Branch was held at the Palmer House on Saturday, January 31, 1942. There was a splendid attendance, about 300 men assembled to hear papers read as follows: "A Short Report on the Metal Situation" by Dr. Blum, read by Mr. H. Smallman, a member of the Board of Managers of Chicago Branch; "Unichrome Alkaline Solution" by T. Coyle, United Chromium Corporation; "Uses of Black Oxide Coatings on Steel in the Present Emergency" by Dr. A. K. Graham; "Indium Finishes for Decorative and Functional Designs" by Dr. W. F. Murray, Indium Company of America; "Some Plating Room Economies" by George B. Hogaboom, Hanson Van Winkle Munning Co.

All the papers were most appropriate at the present time and were well received. There was considerable discussion which brought out many good points in all the papers. L. C. Borchert, E. H. Lyons, Y. Mattacotti, and E. Woodmansee had charge of the Educational Program. Mr. Borchert was Technical Chairman and was introduced by the president of the branch, Mr. C. Kelly.

The Grand Ball room was the scene of the evening's activities. 750 persons partook of the delightful turkey dinner. Music and entertainment followed the banquet. After the floor show dancing was enjoyed, hundreds of couples taking part in the colorful and enjoyable sight.

During the banquet, Rudy Hazucha, well known member of Chicago Branch used his splendid voice to favor us with several popular songs. Needless to say Rudy was given generous applause. It was really our first opportunity to meet Mr. and Mrs. Kelly. Mr. Kelly is highly thought of as the leader of the Chicago Branch.

There were nice delegations from Milwaukee, Detroit, Grand Rapids, Indianapolis and Waterbury. From Waterbury, in addition to President of the A.E.S., Ellsworth Candee, we noticed Robert Leather and Dick Crane from Lea Mfg. Co.

George Hogaboom's talk was short but very much to the point. We are proud to acknowledge that George is an optimist regarding the future of the A.E.S. Unlike many others we have heard recently, he believes that plating will come back stronger than ever in the not too distant future.

We were glad to shake hands again with Frank and Jim Hanlon, Oscar Servis, C. C. Clindinin, Al. Gilbertson, Maurice Littlefield and many others

with whom we had official connections in past years. It is always a pleasant experience to visit Chicago Branch and to partake of their hospitality. We met several friends from other branches including O. T. Towner, Mrs. Towner and son recently located in Cincinnati. Mr. Towner was one of the spark-plugs of Cincinnati Branch. He is now working and residing in Chicago. Ray Goodsell, Past President of the A.E.S. from Racine, was also present. How Ray enjoys these occasions!

We are pleased to notice the fine attendance at the annual meetings we have attended lately. Everyone seems to be seeking information regarding present-day methods of finishing of metals. Our organization must continue to give the industry all the help we can in this direction. Chicago Branch has always been a leader in this connection. This year's meeting was no exception. Good work boys. Our sincere thanks to this year's committees.

ROCKFORD, ILLINOIS

Among the many members of the A.E.S. attending the Chicago Educational Session and Banquet was one whom we were fortunately desirous to see, Mr. Erskine, superintendent of the National Lock Co., Rockford.

Mr. Erskine and others have had a group of men interested in plating and other finishing problems for many months. They also conduct a chemistry class for young men engaged in Metal finishing. As many as fifty attend these meetings at Rockford and at least twenty are members of the class in chemistry. We heartily congratulate Mr. Erskine and the group at Rockford. We invited them to join us as members of the A.E.S., and we understand they are very seriously contemplating such a step.

BUFFALO-ROCHESTER JOINT MEETING

Rochester, April 18, 1942

This meeting will be held in Rochester at the Hotel Seneca on April 18, 1942. The complete committee is as follows:

General Chairman—Mr. John Adams
Honorary Chairman—S. P. Gartland
Program Committee—Judson R. Elster, Chairman
F. H. Bruening—Bernard Schenkel
Entertainment Committee—Paul H. Tufts, Chairman
Ray Berghold
House Committee—Chas. Hendershott, Chairman
Wm. Tucker—Joseph Duffy.
Registration Committee—F. J. Kohlmeier, Chairman,
Raymond DelRosso, Emerson Doell, Louis Hept, Ralph Dettman, Wellington Smith, Emil Fasson, Willard Yorkey.
Ladies Committee—Mrs. John Q. Adams, Chairlady,
All ladies of men on committees.
Educational Committee—Philip LoPresti, Chairman,
F. H. Bruening, Robert Berggren, Joseph Dutton.
Ticket Committee—Ernest and Michael Fasson–Co-chairmen,
Harry Weaver, Willard Yorkey, Robert Graham David Penn, Alvan Chambers, Michael Andrews, Fred Glitzer, Chas. Hehr, Richard Waite, Chas. Wake.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTROPLATERS' SOCIETY

Bridgeport Branch held its regular monthly meeting Friday, December 5, 1941 at 8:00 P.M. at the Stratfield Hotel with a short business meeting followed with an open meeting in the Rose Room at 8:45 P.M. President John E. Charleson opened the meeting and the roll call of officers was read showing all officers were present.

Communications:

Letter from Joe Barron stating that the talking moving pictures taken at Pemberton Inn, Hull, Mass., are now ready for branches to see upon request. A suggestion was made and approved by the Bridgeport Branch that this film should be shown at our annual New England Regional Meeting.

Letter from W. J. R. Kennedy our Exec. Secretary-Treasurer stating that Convention Proceedings are available to new members of our Society at $1.50 per copy. Members wishing copies of these proceedings should contact the secretary at once as there is only a limited amount available. The cost per copy to non-members is five dollars.

Letter from George Wagner our Supreme 2nd Vice-President asking our President to appoint a chairman of the Exhibit Committee of our branch for the next A.E.S. Convention to be held at Grand Rapids, Mich., next June, 1942. President Charleson suggested he would make his appointment at the next meeting held in January, 1942.

Letter from the Visiting Nurses Association of Bridgeport asking us to purchase a five dollar Christmas Seal Bond. The members voted its approval for the purchase of the bond and the secretary was ordered to do so.

Edward G. Loeffell of the Remington Arms Co. was elected to Associate membership. The Treasurer's report was read and accepted. The business meeting was adjourned at 8:45 P. M. to enable the members of the Branch to attend the open meeting conducted by our Librarian, Clarence C. Helmle, with the theme of "Information Please" being employed. Rumors of the success of the first of this type of meeting had reached us from Newark so we decided to try it. We can now report it as being one of the most successful ever held by the Bridgeport Branch.

We were fortunate to have as our guests and consultants, Walter Meyer of *Metal Finishing*, Ed. Bucey of Zapon and Adolf Bregman, consultant.

The meeting was conducted by Chick Helmle who fired the questions at our more than worthy experts. There were so many questions asked that less than half were answered and it appears that it will be necessary to have another such meeting. To attempt to list here the number and variety of questions asked would be impossible, Suffice it to say we covered everything in metal finishing, procurement, priorities etc. from "soup to nuts" including the "finger bowl."

JOSEPH G. STERLING, *Secy.*

Chicago Branch held its regular monthly meeting January 9 at the Atlantic Hotel. President C. Kelly presided and all other officers were present.

The following members were elected

Out of the Test Tube and into Production

Welded Fabrications are Short Cuts to the setting up of new and improved methods

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to associate membership: R. B. Paine, F. Kurt, J. G. Templin, J. J. Cardenas. F. Johnsen and G. Sebastian were elected to active membership. The application of Mr. R. D. Wysong was read and a committee appointed.

Mr. V. Mattacotti introduced the speaker of the evening, a well known member of Chicago Branch, Mr. F. K. Savage, who gave a very interesting talk on "Silver." The prompt way Mr. Savage answered the many questions asked him proved that he really knew Silver.

The sound motion picture (By United States Steel Corp,) "The Bridging of San Francisco Bay," was very interesting. There was an attendance of 70 members at this meeting and that is quite a nice meeting, as the weather was 10° below zero.

J. W. HANLON, *Secy.*

Milwaukee Branch held its January meeting on the day after New Year. In spite of that fact we had a good attendance at our meeting. Our out of town members turned out in good force.

Our speaker was unable to be with us, so we turned the Educational Session into a good old fashioned gab fest. Many things were discussed, some of which were not directly related to plating, but everyone left feeling that such informal discussions occasionally are of benefit.

We are still planning on our Annual Banquet for the end of April, so keep it in mind. Phil Ritzenthaler assures us that the Educational Session in the afternoon will be as unusual as was last year's.

DEXTER F. RHODES, *Secy.*

Cincinnati Branch held its meeting on December 18 with Dr. Allen Gray of the duPont Company as speaker.

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Dr. Gray discussed the corrosion resistance, operating conditions and the advantages of each of the several kinds of lead plating solutions.

He stated that the Fluoborate solution was the best for general purposes as it is a more stable bath and gives finer grain deposits.

The Fluosilicate bath is difficult to prepare for small plating operations but is cheaper than the Fluoborate bath for large scale operations. All lead plating should be at 100% efficiency. Otherwise, the deposit will be spongy.

Harry Misner gave a report on the joint meeting of the Cincinnati, Anderson, Dayton, and Indianapolis branches which will be held at Indianapolis during the month of March.

Dr. Mathers will be the speaker at the January meeting of the Cincinnati Branch.

MARTIN M. GANNON, JR., *Secy.*

Detroit Branch held its regular monthly meeting Friday, January 9, at 8:15 P.M. with Vice-Pres. James E. Fritts presiding. Pres. Walter L. Pinner sent a letter to be read at the meeting expressing his regret that circumstances forced his absence from this meeting. He wished especially to convey his thanks, as well as those of the entire Branch, to Mr. McCord and the members of his committee, through whose efforts our recent annual meeting and banquet was a complete success.

A moving picture, "The Magic of Modern Plastics", was shown through the courtesy of the Breskin Publishing Co., publishers of "Modern Plastics" magazine. The members then enjoyed a thorough discussion on plastics by Mr. S. D. Hiltebrant of the Bakelite Corp. who brought with him a fine collection of samples. The highlights of his talk covered the growth of plastics since their inception some seventy years ago and the commercial presentation of cellulose nitrate. That the plastics industry today is most generally thought of as consisting of the thermosetting, or hot set plastics, and the thermoplastic, or cold set type.

The thermosetting type materials commercially used today are the phenol formaldehyde, the phenol furfural and the urea formaldehyde. The thermoplastic type materials are the cellulose acetate, methyl methacrylate, cellulose aceto butyrate, polystyrene and vinyl compounds.

Mr. Hiltebrant pointed out the wide use and extent of application possible if the proper plastic is chosen. Plastics are used for such utilitarian purposes as buttons, bottle caps, cooking utensils handles, refrigerators and radios; and for electrical applications such as automobile ignition systems, low-loss power equipment, telephones and in numerous places as central power stations. Also, for such applications as shades and reflectors in lighting equipment, automotive trim, airplane windshields, highway signals, phonograph records, tooth brush handles, storage batteries and as a bond in safety glass.

He mentioned that plastics are used in electroplating in the phenol formaldehyde form in plating valves or in actual materials to be plated. These materials are covered with conductive adhesive material and can then be plated with any metal desired. It might be said that the majority of them resist electroplating solutions with the exception of chromic acid. However, the polystyrene type even resists the chromic acid when under 170 degrees fahrenheit.

He pointed out the ever-increasing number of Defense applications for

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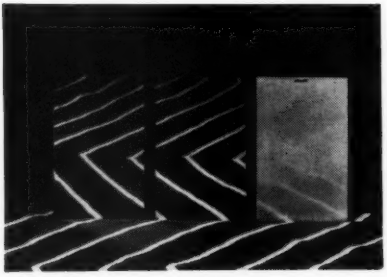

SURFACE CLEANED—NON-ETCHED AND ETCH

Here are three pieces of polished sheet aluminum standing on patterned piece of cloth to illustrate surface lustre.

At the left is the original polished aluminum clearly reflecting image of the material design. The center sheet has been cleaned with MATAWAN AL CLEANER. The clarity of reflection remains unimpaired for MATAWAN AL is non-etching.

The right-hand sheet was cleaned for 30 seconds in a good MATAWAN CLEANER, but one that etches.

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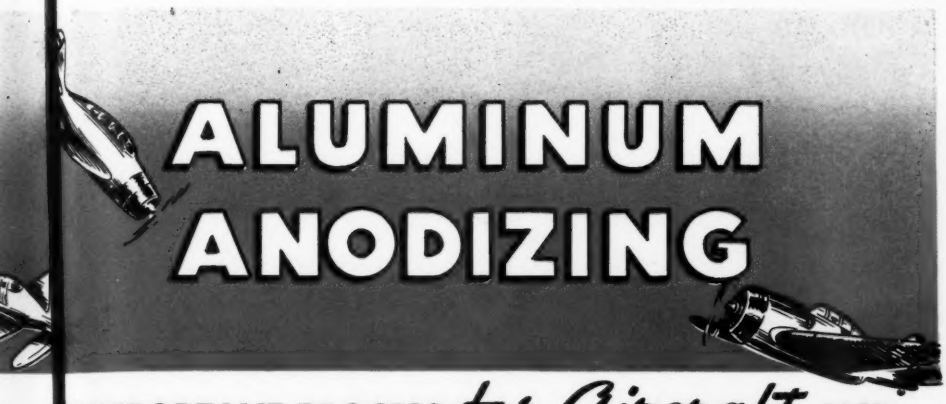

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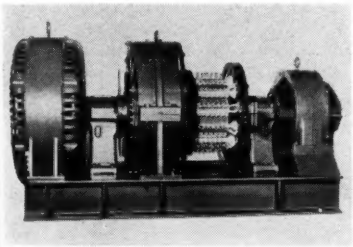

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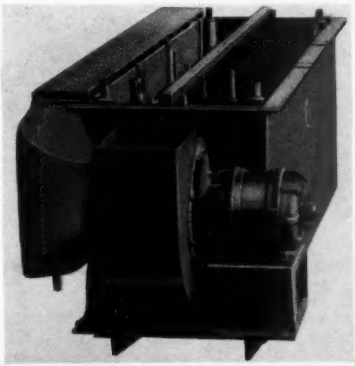

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plastic materials and mentioned trench mortar shell fuses, wire coating, airplane wing lights, dials, instrument cases, Navy control parts and even plastic bonded plywood training planes.

Mr. Hiltebrant found the members very much interested and answered many questions from the floor. At the conclusion of the Question Box by Librarian Hahn the meeting was adjourned at 10:15 P.M.

WARREN I. GRIMMER, *Secy.*

Newark Branch held its first meeting of the year on Friday evening, January 9, 1942 at the Hotel Robert Treat, Newark, N. J. The meeting was called to order at 8:30 P.M. with President Wm. T. Maguire presiding.

A communication from James Monagle requesting a transfer from our Branch to Indianapolis Branch was read and Jim's request was granted. A communication from Merck and Company was read and the Secretary was instructed to answer same. An invoice for third quarter Capita tax in the amount of $95.18 was voted to be paid.

Under new business, Mr. Horace H. Smith was appointed Chairman of the Banquet Committee. The Banquet is scheduled for April 11, 1942 in the ballroom of the Hotel Robert Treat, Newark, N. J.

The speakers for the evening were two Newark Branch members, George Wagner and Royal F. Clark, Sr., who were presented to the Branch by our Librarian, Mr. Louis Donroe. Mr. Wagner's subject was "Chromium Plating on Brass;" Mr. Clark's "Copper Plating Phonograph Matrix." Both subjects were well received and the speakers were given a rising vote of thanks by the 47 members who attended.

GEORGE WAGNER, *Secy.*

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Los Angeles Branch held its regular meeting as usual at the Rosslyn Hotel.

After the meeting had been duly opened and the regular business attended to Mr. ApRoberts, Second-Vice-President in charge of exhibits, made a plea that all those who possibly could, submit an exhibit both for our local Educational Session and the National Convention. Mr. Rynkofs volunteered to have an exhibit and he also pointed a prodding finger at six or eight other members whose work is worthy of exhibition. With this example and encouragement the Branch expects to see what some of our members do for a living.

At the conclusion of the business session the Librarian took charge. Mr. Earl Coffin was the speaker of the evening and read a paper he had prepared on "Linings for Tanks in the

Plating Shop." Mr. Coffin told of the good tanks and linings that he had used and the bad ones he had cussed at, and from there on the discussion was wide open. In Mr. Coffin's paper as well as in the following discussion it was brought out that for alkaline cleaning solutions nothing is better than a plain steel tank, though nickel coated steel anodes are recommended where an electric current is employed rather than using the tank for the anode. Plain unlined spruce or yellow pine tanks may be used for cold sulphuric or muriatic pickles but even here asphaltum lining is recommended. With asphaltum lining these wooden tanks may be used for cold nickel or acid copper, their principal advantage being their low cost. Lead lining is the only satisfactory lining for chrome solutions and is also good for acid copper. In conclusion it was brought out that steel is attacked by any solution containing chlorides and a non-conducting lining is to be preferred wherever possible. Also as with everything else even the best lining must be installed properly for satisfactory service.

We then had the Question Box after which a picture "Mountains of Copper" was screened.

ERVIN FRAUENHOFF, *Secy.*

Ed. Note (Mr. Coffin's paper in its entirety is included in this month's REVIEW.)

Anderson Branch held its monthly dinner meeting January 13, at 6:45 P.M. at the Anderson Y.M.C.A. President R. W. Oyler presided. Librarian R. M. Wagner introduced the speaker for the evening, Mr. R. O. Hull of the E. I. duPont de Nemours & Co., Inc., Cleveland, Ohio. Mr. Hull presented, by means of a slide projector, the theory and explanation of the

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"Hull Cell." This was followed by demonstrations of the cell using a test brass solution as well as other plating solutions brought to the meeting by various platers.

The meeting was of interest to everyone present and adjourned after 11 o'clock only because Mr. Hull had to catch a train at 11:30 P.M.

E. L. MCKINNEY, *Secy.*

Buffalo Branch held its regular monthly meeting on Friday, January 9, with President Joe Ruff in the chair. The regular business of the meeting was quickly transacted and the meeting proceeded.

Mr. Van der Horst of Hilversum, Holland, the guest speaker, was introduced to the branch by the President. Seldom have we had the experience of hearing such a confirmed authority on the subject of "Chromium Plating." It was delightful to hear his views and he spoke as one entirely conversant with his subject. He has been engaged by the Dutch and British governments and he is at present extensively engaged in our own defense program.

His experiences covered the complete field from decorative chrome plating to chrome hardening particularly as applied to cylinder hardening of internal combustion engines. In the latter branch of the industry he had followed the contention of Mr. Riccardo, the well known engine designer, that corrosion was the chief factor in causing cylinder wear. Chromium plating, with its low co-efficient of friction and its high corrosion resistant qualities was an excellent means of overcoming corrosion. His initial successes in this field had been achieved with marine engines and he had been thus encouraged to enter the automobile industry. His early experiments here had not been wholly satisfactory as these engines run at comparatively high speeds and lubrication of the walls was not adequate because oil would not cling to the chromium. A porous chromium plate which would retain the oil had been developed and this had proved entirely successful. Unfortunately for obvious reasons this process could not be divulged at present.

Of particular significance was the emphasis he placed on the close cooperation necessary between the engineering and plating departments. The racks and contacts which would give a uniform thickness of plate throughout the bore of the cylinder were of a highly specialized construction and their manufacture required much thought and precision work.

He concluded his talk by answering a wide range of questions and with illustrations and explanations of the

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various problems he had encountered in his work. The entire talk delivered by Mr. Van der Horst occupied well over two hours and the time passed so quickly and enjoyably that it is hoped that we will have the pleasure of his company and the benefit of his services at some future date.

RHODERICK MCGHEE, *Secy.*

Boston Branch was called to order for its January meeting with President Jones in the chair. Two applications were read and elected to membership: Samuel Slavit, 89 Emerson St., Haverhill, Mass., Active, and Norman A. Searles, 1405 Fordham Ave., Schenectady, N. Y., Associate. Two received and read for the first time, Max Blyer, 126 Franklin Ave., Chelsea, Mass., Active, Hyman Levy, American Electroplating Works, 186 Mass. Ave., Cambridge, Mass. Bert Sage was granted a transfer from Boston to the Waterbury Branch.

Arthur Mintie reported on the work being done to teach the members electroplating chemistry so that they may be better able to handle their solutions and work being done today. This class meets Thursday at M.I.T. room 8-319.

Arthur J. Mintie was appointed as chairman of the exhibits for the 1942 convention at Grand Rapids, he will also fill the vacancy on the Board of Managers.

The Banquet will be held March 28th at the Statler Hotel, tickets will be $3.00 so keep this date open for a barrel of fun.

Librarian's Report

The educational part of the meeting was featured by two speakers, Bill Starr of Lea Manufacturing Company, and Bob Sizelove of the Frederick Gumm Chemical Company.

Bill Starr talked on "Priorities and Their Effect on Electroplating." He explained the need for government control of materials and described the different types of orders and demands of the defense agencies. He also outlined the best sources of information with regard to the rulings of the various boards.

He was followed by Bob Sizelove who talked on "Changes in Cleaning Techniques Necessitated by Defense Needs and Shortages." This talk covered a wide range of cleaning problems and effective cleaning methods. Mr. Sizelove emphasized the many changes being made in metals used for various

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applications. This means that electroplaters must be ready to change their cleaning procedures to meet the situation. Plating with insoluble anodes in various metal baths was also discussed by this speaker.

Following the two talks the meeting was declared open for questions and discussion. Plenty of questions were asked and answered by Bill Starr and Bob Sizelove who were assisted on some questions by Ralph McCahan of duPont.

ANDREW W. GARRETT, *Secy.*

Newark Branch held its regular meeting on Friday evening, December 19, 1941 at the Hotel Robert Treat in Newark, N. J. The meeting was called to order at 8:30 P.M. with President William T. Maguire presiding.

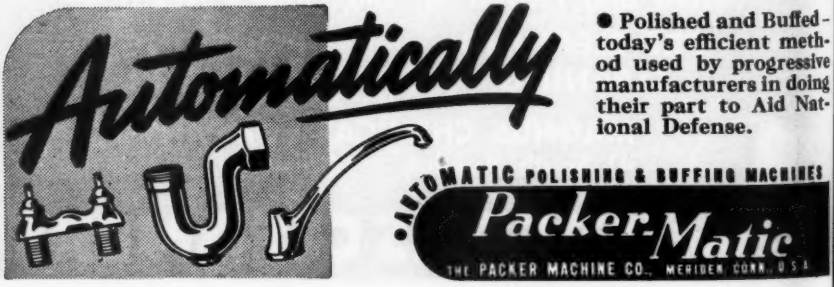
A communication from the Chicago Branch with reference to their Annual Banquet scheduled for January 31, 1942 was read and placed on file. A communication from William J. R. Kennedy with reference to a prospective member, Dr. Lowenheim, Research Chemist at Cartaret, N. J. was read and placed on file.

Mr. Adam Munn and Mr. Michael D'Elia were elected to Active Membership and Mr. John Cluff, Mr. James W. Phelps, Mr. Henry W. Lovett and Mr. Oliver Gautreau to Associate Membership. Application for George V. Galanti of the Western Electric Co. to Associate Membership was voted to take the regular course.

Mr. Horace Smith reported that a wonderful time was had by all who attended our Christmas Party. He expressed his appreciation and that of the Branch to Paul A. Oldam for the eloquent manner in which Paul conducted the entertainment. Mr. Wagner expressed his appreciation to the membership for the Solid Gold membership card case containing both the Masonic and the Elks Emblem, which was presented to him at the Christmas Party.

Under new business Mr. Horace Smith made a motion that the Newark Branch of the American Electroplaters Society purchase a $500.00 Defense Savings Bond and donate $10.00 to the American Red Cross. This motion was seconded and unanimously adopted. The Secretary was authorized to purchase the bond and to send a check to the Red Cross.

Mr. Paul Oldam was appointed by the chair to act as Chairman of the Exhibit Committee for Newark Branch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Mr. Oldam next presented the guest speaker of the evening, Mr. Joseph Kushner, Consulting Engineer, whose subject was "Gold Plating." Mr. Kushner's talk was most interesting and will be forwarded to the MONTHLY REVIEW for publication. He was given a rising vote of thanks by the 42 members present.

GEORGE WAGNER, *Secy.*

St. Louis Branch held its regular meeting on Monday January 5, 1942. Dinner was served and then the meeting was called to order by President Harath. John Vogt gave a resume of the December meeting which was accepted. One applicant was elected to membership.

It was suggested that we hold an open meeting some evening and invite the ladies. Mr. Daw will entertain by showing pictures that were taken at our summer picnic. Maybe the ladies would like to see how they look in the movies? It was also suggested that the secretary get out a form letter stating what the program would be for the meeting. Mr. Harath and J. Vogt to make arrangements and inform the secretary.

Meeting turned over to J. Vogt, who with an assistant explained the working of the Magna Gage, and measured the thickness of the different coatings.

Many questions were asked. Then the question came up does a moving cathode put on a more even deposit? Mr. Errington is to explain it to us at one of our future meetings. A rising vote of thanks was given to Mr. Vogt and his co-workers. Next meeting February 2, 1942.

C. MCGINLEY, *Secy.*

Toledo Branch held its regular meeting on December 4, 1941 at the Hillcrest Hotel. The members and our two distinguished guests, Mr. Kennedy, National Secretary, and Mr. Smith of Grand Rapids, had dinner together just prior to the business meeting.

The business meeting started at 8:00 P. M., Mr. Vannorsdall presiding. A second Vice-President is to be elected at the next regular meeting. Due to the fact that he is leaving town Mr. Shank resigned as chairman of the membership committee; a new membership chairman is to be appointed at the next regular meeting. Mr. Shank wished to have his membership in the Toledo branch retained for the remainder of this fiscal year. Mr. Miner reported that the money was sent to Cleveland for their share of the joint meeting held last summer. Three applications for membership in the Toldeo branch were acted upon and accepted. They were: Chas. Young as an associate member, Clifford Cole as an active member, and David Wilczynski as an active member.

At this time Mr. Kennedy addressed

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the members in regard to the betterment of the branch and the society as a whole, after which he discussed local problems with the members.

Mr. Smith of The J. C. Miller Co., the speaker for the evening, gave a very good talk on "Citrate Addition to Cyanide Copper Plating Solutions." He also suggested some very good ideas to make the meetings more interesting. At the end of his talk Mr. Smith was given a vote of thanks.

G.P. H. BERGEMAN, *Secy.*

Toronto Branch held its first regular meeting of 1942 in room B, King Edward Hotel, January 2, President Graham in the chair. In declaring the meeting open with "Gentlemen I wish you a happy new year", some members who had been absent for a time were welcomed back and took an active part in the evenings proceedings.

The applications of Mr. Ben Stockley and Mr. Alex Achesion were balloted on and elected into membershlp.

Jack McLean came in for a hearty welcome from the members who were glad to see him; Jack was ill for quite a time and is well on the way of recovery.

Having no speaker for the evening, Allan Byers, Tom Boaz and Art Severs thought up a new one in the shape of a quiz program, cigars, cigarettes and other useful things being the prizes.

Most of the questions were taken from the REVIEW, naming different deposits of silver, copper, nickel, and chrome, oxides, firescale, brighteners, and cleaners.

This was one of the most interesting meetings ever held in the King Edward Hotel the 43 members showing appreciation and asked the committee to bring along another one in the near future.

JAMES S. CAIRNS, *Secy.*

Waterbury Branch held its regular meeting on Friday, January 9 at the Hotel Elton. The meeting was preceded by dinner at 6:30, at which twenty-nine were present. Jack English won the drawing for the free dinner.

President Ralph Colter opened the meeting promptly at eight o'clock with the announcement that the next business meeting will be held at the home of Carl Kilborn, 223 Circular Avenue, Waterbury, on January twenty-eighth.

The thirtieth annual educational session of the Chicago Branch is to be held January thirty-first at the Palmer House in Chicago. Anyone desiring to attend should make reservations immediately with the Secretary, Mr. W. J. Hanlon.

There being no other business the meeting was turned over to Tony Maz, the Technical Chairman, who first presented two Moving Pictures loaned through the courtesy of the Bureau of Mines and the International Nickel Company, showing the mining and refining of nickel.

Dr. M. M. Beckwith who was then introduced had for his subject, "Vagar-

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ious Electric Circuits in Plating Sequences." By numerous examples he showed us how necessary it was to have proper insulation and the right polarity on plating and cleaning equipment. He showed how differences in polarity can occur between different metals in the same bath. These differences adversely affecting either one or both of the metals. Many of our plating troubles can be traced to current in the wrong place. Dr. Beckwith's paper was much enjoyed and many questions were asked which led to an interesting discussion.

Dr. George Dubpernell reviewed Volume I of Mattiello's new book on "Paint and Lacquer." The book is an excellent reference on gums and solvents used in the Paint Industry and will be followed by Volume II which will deal with pigments, and Volume III which will deal with the manufacturing of paints and lacquers.

SPENCER L. HENN, *Secy.*

Syracuse Branch held its January meeting at the University Friday, January 9th with the counter attraction being Joe Louis and Buddy Baer. We thought the turn out of 35 or so was very good. The meeting was started promptly at 7:30 P.M. by our President Mr. D. Overcash. Minutes of the last meeting (November 1941) were gone over briefly.

Dr. Murphy outlined to us the course in Solution Analysis, etc., that is government financed, available at the University for anyone interested. One class has just finished. Another one just forming sounds like a splendid opportunity for anyone in the electroplating field.

Our Librarian, Mr. A. Giorgi, introduced the speaker of the evening Mr. Wm. Schneider of the duPont Company who spoke on "Alkaline Tin Plating. He had some very nice samples of all kinds of products plated with this process, the hair curlers being particularly interesting in view of the story Bill told of trouble experienced with the aluminum curlers but the tin plated steel ones were never causing any "rusty blondes" etc. Of course we all wanted to know how, when, and where to get the tin. In this connection it was brought out that this process could be worked very successfully without tin anodes and due to the stannate being, to a very large extent, a recovery process of tin from scrap tin cans etc., it did promise possibilities as a substitute for Nickel, Chromium, etc. The characteristics of electro-deposited tin seem to be far different from the conventional molten tin dipping processes. The speaker touched on the apparent absence of the well known tin disease which has never been found in the plated tin. Summing up Mr. Schneider's talk we would like to predict that a great deal more tin plating will be done after this

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"Pacific disturbance" (quote Bill) is over.

During our question and answer period one of our members brought along a piece of deposited Nickel taken from the contacts of a barrel and asked, how can this be used as Anode? It was brought out that there must be large quantities of such so called scrap Nickel which is of course purer Nickel than any Anode made but due to its passivity cannot be corroded in a regular Nickel bath. Our own member, Dr. Murphy of the Syracuse faculty, took it and we are hoping for some kind of a report on it at our next meeting. If any members of the Society have any suggestions on this we would be glad to hear from them. The thought is of course to use this up in baskets the same as Anode stubs.

One application was received at this meeting.

The speaker for the February meeting will be Mr. A. Chenis of the Bullard Dunn Company of Bridgeport, Conn. GEORGE SIMMONS, *Secy.*

Baltimore-Washington Branch held its regular monthly meeting in Washington on January 10, 1942. As usual, a dinner preceded the meeting, both of which were graced by the presence of Bill Kennedy, the genial Executive Secretary of the Supreme Society. Bill spoke briefly on the "state of the nation" with respect to plating, and was advised informally and on request that we wanted our Annual Convention at Grand Rapids held, unless all the platers were in uniform by then.

Our amazing membership committee announced that its goal of doubling our membership was in sight, with the election of seven new members and the receipt of eight new applications. In as much as Chairman Warnock was acting president for the evening, Bill Kennedy had to sponsor a rising vote of thanks to the committee.

The Annual Meeting Committee, consisting of Barrows and Brenner, also gave an excellent report of prospects for an interesting and profitable session on February 7th, with a Defense Program for the educational session at 4 P.M., and a bigger and better dinner and dance with many entertainment features, beginning at 7 P.M. at the Lee Sheraton Hotel in Washington.

The educational feature was a very practical and tactful account of the performance of the copper oxide rectifier as a source of power for electroplating and allied processes, given us by Mr. J. A. Lee of the General Electric Co. C. T. THOMAS, *Secy.*

Indianapolis Branch held its January 3 meeting as usual in the Hotel

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Riley. Mr. W. W. Cothran, educational Chairman for the evening introduced Mr. E. G. Coyle of the United Chromium Corp.

Mr. Coyle in addressing the branch introduced the members to a very new and very interesting process known as Unichrome Copper. Unichrome Copper was presented in the three most important aspects of any process: the deposit, the solution itself, and the control necessary.

The deposit has the following qualities:

(a) smoothness and lustre.
(b) not extremely bright—usually figure on buffing slightly.
(c) softer than cyanide copper but harder than acid copper.
(d) fine grain.
(e) capable of .001—.002 without losing brightness.
(f) low buffer loss—less than one-half ten-thousandth on a one thousandth plate.
(g) takes oxidized finishes.
(h) etches well.
(i) has good distribution.

The solution itself:

(a) Content
3-6 oz. per gal. copper
20-40 oz. per gal. pyrophosphate
Buffer set.
Ammonia.
Temperature—100°-140°F.
pH—8/0-8.5
Sp. Gr.—1.3 or 35° Banuae.
(b) No cyanide, Rochelle salts, carbonates, caustic, brighteners, anti-pit agents, wetting agents, are necessary.
(c) Mildly alkaline, non-corrosive, non-toxic, non-gassing, no break down of salts.
(d) Bivalent copper—current density—20-40 A.S.F.—100% efficiency anode and cathode.

The control needed:

(a) pH—Raise with ammonia. Bring down with pyrophosphoric acid. Use glass electrode.
(b) Little heat therefore low evaporation.
(c) No bagging of anodes necessary.
(d) Air agitation preferred. No agitation—narrows the bright range.

The process can also include barrel plating and a strike need only be used before the copper when nickel is to be used afterwards.

LELAND E. BASS, *Secy.*

Grand Rapids Branch held its regular meeting January 9th in the Wolverine Room of the Rowe Hotel. The meeting was called to order promptly at 8:30. Minutes of the previous meeting were read and approved. There were no communications to be read.

Reports of the various committees were again given on the progress of the Fifth Annual Dinner Dance and Educational Session, and approved.

Three members were elected:

Mr. Leo Richard Davidson, Associate member, Mr. Bernard Groth,

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Active member, Mr. Jack Blanchard Cole, Active member.

Two applications were presented for election.

There being no further business, the meeting was immediately turned over to those in charge of the entertainment and we were shown technicolor pictures of the Boston Covention held last June, 1941 and also colored moving pictures of the Dayton Convention held in 1940. After these pictures were shown, which were enjoyed by all, another sound movie was given entitled "Aladdin's Lamp" These pictures were sponsored by the Frederick B. Stevens Company through our own member, Richard D. Alden.

C. E. ABEL, *Secy.*

Montreal Branch held its regular monthly meeting, in the Mount Royal Hotel, Monday, Jan. 5th 1942. The meeting was called to order by President Jordon.

At the conclusion of the business session the meeting was turned over to our Librarian, Mr. E. H. Marsh, of the Union Screen Plate Co. who spoke on the "Plater's Part in Defense"—First, how we can conserve metals in the plating shop. Second, what we should be careful of in reading government specifications and blue prints and not jump to conclusions and plate what we personally think would do. Third, get what information we can about the job, i.e., the type of steel, what it is used for, whether it is subject to chemical corrosion or abrasion; in short, get the information so that we can approach the job with some intelligence. Fourth, the reason for all these questions is that if we don't know most of the facts first and do the job in the ordinary way, i.e., treat most of these specialized jobs the same as we would automobile bumpers etc., then when the part fails to stand up the platers as a whole get a very bad knock which most of the concerns now doing war work will remember when this is all over and will turn to some other products to help them out of their difficulties.

Mr. Marsh received a rising vote of thanks and the meeting adjourned at 11 o'clock.

EUGENE FEELEY, *Secy.*

Bridgeport Branch held its regular monthly meeting Thursday, January 8, 1942, at the Stratfield Hotel. The meeting was called to order by Dr. Walter R. Meyer, who was called upon to preside in the absence of President John E. Charleson, who is convalescing at the Stamford Hospital after an operation.

Vice President Charles McElroy was also reported absent. We were honored

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with the presence of Mr. W. J. R. Kennedy, our Executive Secretary and Treasurer, who stopped in to see us on his way to Washington, D.C. We are always glad to see and hear "Bill" who has many interesting reports to offer concerning the good and the welfare of our Society.

A letter inviting members of the Bridgeport Branch to attend the Waterbury Branch January Educational Session was read and placed on file. A letter from the Chicago Branch concerning their annual Educational Session and Dinner Dance was read and placed on file. A motion was made, seconded and approved to hold meetings the first Friday of every month instead of the first Thursday of each month. The Secretary was ordered to send out notices to this effect. Bills against the Branch were ordered to be paid.

Suggestions were offered by our Executive Secretary W. J. R. Kennedy and Dr. Walter R. Meyer to hold and increase interest in the affairs of the Society. A good discussion of the various problems of the plating industry was held and proved very interesting. The Treasurer's Report was read and accepted, and the meeting was adjourned at 10:15 P.M.

JOSEPH G. STERLING, *Secy.*

Philadelphia Branch held its regular meeting January 23rd, the 4th Friday. President Harry Keller opened the meeting at 8:25 P.M. with all officers present except Al Hirsch; who was absent, due to the recent death of his wife.

Librarian Gene Zurbach Jr., introduced Dr. Graham, the speaker of the evening, Dr. Graham, after a short review of the serious shortage of metals, announced his subject, the "Use of Black Oxide Coatings on Steel in the Present Emergency."

PLATING BARRELS WANTED — complete barrel plant — of six or eight plating barrels for acid and cyanide solutions; 2 burnishing barrels; 2 tumbling barrels; 2 dryers; all required accessories. Will buy plant as a unit or assemble in smaller lots. Must be in first class condition. The advertiser is not a dealer but a user of this equipment. Write to PLATING OPERATOR, c/o The Monthly Review, 93 Oak Grove Ave., Springfield, Mass.

Reviewing the past methods, he brought us to the present methods; namely, the nitrates and the nitrites (Jetal).

Dr. Graham illustrated by lantern slides the comparative values, in which the Jetal method proved to be the faster method of oxidizing; also, had a better salt spray value. Dr. Graham spent quite a bit of time answering the questions of the members.

Under communications—Cards of appreciation from Albert Hirsch and Family were received.

Meeting adjourned at 10:50 P.M.

PAUL MENTZER, *Secy.*

(Ed. Note: See under membership report.)

Rochester Branch held its regular monthly meeting on Friday night January 16 at the Rochester Turn Verein. This was held as a Dinner meeting. Our guest speaker was Mr. M. M. Beckwith, chemist of the J. B. Ford Sales Co. His topic was "Vagarious Electric Plating Circuits." At first this topic sounded like some high falutin subject but it really turned out to be a subject of very great interest to all platers, Mr. Beckwith talked of the various stray currents in not only plating solutions but also in cleaning and rinsing solutions. He mentioned these various currents running around and alluded to them as Yahoodees or

hants. One word he said was used rather loosely and that was equilibrium. He showed us how a bad or loose contact on a rack could cause difficulties by having both positive and negative sides thus causing peeling and double plating. After the talk Mr. Beckwith very kindly answered a barrage of questions after which he was given a rising vote of thanks for a very educational talk.

JUDSON R. ELSTER, *Secy.*

(Ed. Note: See under membership report.)

Hartford Branch held its January meeting at the New Britain Trade School, New Britain, Conn. Monday evening, January 19th.

Mr. Selwyn Cooper of the Zapon division of the Atlas Powder Co. of Stamford, Conn. was the speaker for the evening. "Priorities and Their Effect on the Finishing Industry" was the subject discussed and proved beyond doubt Mr. Cooper's ability and experiences with the Priority Control. He gave us a complete picture of the effect on the lacquer industry and the troubles they experience in obtaining the necessary raw materials to keep their products up to their high standards. Also to provide suitable substitutes in cases where supplies have been cut off due to control or world wide conditions.

About 25 members and friends attended this meeting. Mr. Reed E. MacLane of the Hartford Machine Screw Co. was elected an associate member.

APLEY N. AUSTIN, *Secy.*

Springfield Branch held its January meeting at the Hotel Charles on the 26th at 8:00 P.M.

President Wood introduced Mr. R. H. McCahan, Technical representative of the E. I. duPont de Nemours Co., who presented an interesting talk on "Stannate Tin Plating." Mr. McCahan described the advantages of the stannate tin solution, he explained the concentrations of the various ingredients in the tin solution and also their functions. In addition he explained the status of the other strategic metals, and described their use and application. Mr. McCahan was kept busy after the talk answering the questions of members and guests.

The secretary then read the minutes of the previous meeting. They were approved and the following applicants were accepted as members: Mr. Norman A. Searles, and John Koster. The following applications were received and placed on file: Harry Goldberg, F. W. Sickles Co., Wayne B. Sanders, The Mosher Co., John Weir, L. D. Van Valkenburg Co., Clemens C. Tisca, General Electric Co., Pittsfield, Mass., and Fred D. Crosby Jr., General Electric Co., Pittsfield, Mass.

Mr. Kennedy announced that due to present conditions the annual convention will be of only three days duration and that the exhibits and part of the social activities will be deleted.

D. S. HARTSHORN, JR., *Secy.*

Newark Branch regular meeting was called to order at 8:30 P.M. on Friday evening, January 23, 1942, at the Hotel Robert Treat, Newark, N. J. President William T. Maguire presided with all other officers present.

Applications for Jules Falk and Alfred McGrath of the Western Electric Co. to Active membership and Frederick A. Lowenheim of Metal & Thermit Corp. to Associate membership were voted to take the regular course. Mr. Louis Maine and Mr. Arthur J.

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Miller were elected to Associate membership.

George Wagner reported in his capacity as Chairman of the Exhibits Committee for the 1942 Convention that at a meeting held by members of the Executive Board and Grand Rapids Convention Committee it was decided that there should be no Exhibits of any kind, the reason being that there would be little or nothing of interest to Exhibit, due to metal shortages, etc. In place of this there will be a photographic display of past conventions, pictures of outstanding events in the plating industry and other items of interest connected with the trade. Also that there will be a 3-day session instead of 4-Monday, Tuesday and Wednesday, June 8-9-10.

Mr. Louis Donroe next presented the guest speaker for the evening, Mr. Edwin Rinker of Oakite Products Co. His subject was "Newer Cleaning Methods." Mr. Rinker's talk dealt solely with alkali cleaning baths using the anodic or reverse current method. He exhibited charts from a slide lantern illustrating the results of various chemicals in an alkali cleaning bath, at various bath compositions and varying temperatures, cleaning time ranging between 5 and 15 minutes. Ed didn't do any advertising but stated that most of the chemicals used in this method could be procured from the Oakite Products Company or any other supply house. He was given a rising vote of thanks for his talk by the 44 members who attended the meeting.

Mr. David Clarin, a former member of Newark Branch, also attended this meeting and was called upon for a few remarks. GEORGE WAGNER, *Secy.*

Mr. William Kennedy
American Electroplaters' Society
Springfield, Mass.

Dear Bill:

I am writing to you regarding the creation of more interest in the possibilities of Hard Chromium Plating.

That may sound foolish at this time but I wonder if the advantages of Hard Chrome plating are brought to the attention of the users of tools, dies, fixtures etc., or in other words do the manufacturers in the country know that drills, taps, and reamers which have been discarded because of being undersize can be plated to size and will then outlast a new tool.

Do you think it is generally known that all kinds of dies, forming, piercing, perforating, etc., can be successfully Hard Chrome Plated and outlast any plain steel die or punch?

Some advertising along the right lines and reaching the right people will go a long way towards keeping our present plating rooms operating.

For proof of this statement I would like to cite our last platers meeting of this branch which was held in Binghamton. We invited to this meeting, all the method and industrial engineers, tool room, pressroom, and welding department foremen and tool designers, of the local manufacturing companies. Then I had our tool room foreman, and our pressroom foreman and myself down there with all kinds of tools and dies and with samples of the work we are doing together with actual figures from company records of what is being done.—Today we cannot handle the work that is being offered to us to do.

The cry in the defense industry is for more tools and more tool steel, everything wears out so fast. Hard chromium will make some tools last forever, and increase the life of dies indefinitely. We have the answer, lets tell the world.

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GENERAL ELECTRIC

THE QUESTION BOX

Indianapolis Branch

1. *What is the comparative protection from weather corrosion of silver and nickel of the same thickness?*

Ans. (Ross) Nickel is better for luster retention.

Ans. (Binai) Silver is less porous in thin deposits.

2. *Is it possible to black-nickel plate* 18-8 *stainless steel and how?*

Ans. (Binai) Black nickel can be applied by making the work anodic in hydrochloric acid, or by dipping it into a nickel chloride-hydrochloric acid dip, or by plating it in a nickel chloride-hydrochloric acid solution. After any one of these preliminary treatments, the regular plating can be applied.

3. *What is the best way to strip tin plate from steel?*

Ans. Use a solution made up of equal parts of hydrochloric acid and water to which is added 2 oz./gal. of antimony oxide. After the stripping action ceases, brush off the smudge with pumice and water.

4. *What is the maximum amount of copper that can be in a chrome solution without causing trouble and how can copper be removed?*

Ans. One member stated that he had experienced 4 oz./gal. of copper without trouble but knew of no way to remove the copper.

5. *Is descaling with sulphuric acid with current better and faster than straight pickling for heavy scale?*

Ans. (Lockwood) Yes. Use two tanks, one 1.38 Bé at 60 degrees F., and the other 1.25 Bé and 125 degrees F.

6. *How can trivalent chromium be removed from a chromium solution?*

Ans. (Binai) Electrolyze the solution using a steel cathode in a porous cup.

7. *Is there a better brightener than carbon disulphide for silver solutions?*

Ans. (Binai) 1 to 2 grams per liter of "hype" and 1/2 cc./liter of ammonia have been used.

8. *What is the best means of cleaning steel before silver plating?*

Ans. (Cothran) An anodic cleaner is better than the old type cathodic cleaner.

9. *What is a satisfactory separating medium between acid copper plate and a metal object?*

Ans. (Allison) Iodine solution, silver plate and then wash with iodine solution, rubber cement, diluted 4 to 1 with benzol and dusted with graphite.

10. *Please explain the Penetrate process and how it differs from other finishes?*

Ans. (Lockwood) This is a high caustic solution that forms an oxide coating on the steel.

11. *What tests can be used to determine the strength of the electrolytic bond?*

Ans. Plate on a cylinder and put in a testing machine to determine stress necessary to separate plate.

Ans. (Binai) F. Mesle measured the adherence of silver to steel by chromium plating some steel strips on half their length. When these were silver plated the plate could be torn down and the adherence of the silver noted.

Ans. Bend test.

E. A. BLOUNT, *Secy. Protem.*

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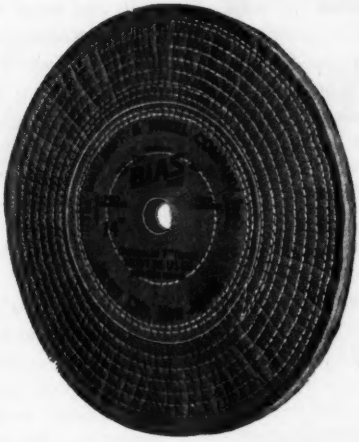

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COMPLETE PLATING PLANTS INSTALLED

Boston Branch

1. *If copper cyanide is used to maintain the metal in a cyanide copper solution using insoluble anodes, will the free cyanide build up rapidly?*

A. This bath is being plated using insoluble anodes and copper cyanide additions without appreciable free cyanide build up. Perhaps the high temperature (around 130° F.) helps to prevent this build up.

2. *What material is used for an etching cleaner for aluminum? Is caustic soda satisfactory?*

A. Caustic soda has been found to give a coarse etch which is also non-uniform on dirty work due to selective etching. Uneven distribution of the oil or dirt causes uneven etching. A compounded emulsifying alkali has been developed which gives a fine uniform etch. This material also causes no build-up of sodium aluminate on the coils and bottom of the tank.

3. *Will metal cleaners be hard to get due to the war?*

A. On allocations about the same quantity is available, as last year; phosphates and soda ash may be hard to get.

4. *We have heard of plating on anodes in a separate tank of single nickel salts and using these anodes in a regular nickel plating bath, is this method restricted by any O.P.M. ruling?*

A. Mr. McCahan discussed this question and stressed the fact that we are at war. Although this method of plating and other questionable practices may not be specifically restricted, they are evasions of the intent of the law. If the United States is to win the war, everyone must cooperate with the government. Perhaps there are technicalities to evade the law as written but that's no method to use to win a war. We've got to work with our government and try to aid it, not hinder it. We must help the laws and rulings to accomplish their purpose.

5. *Can aluminum be used for bus bar?*

A. Yes, about the same size as copper bus bar can be used if the aluminum is painted black.

6. *What is a good source of information on priorities?*

A. The weekly *Victory* formerly called *Defense*. This can be obtained by writing to the Division of Information, Office for Emergency Manage-

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GRINDING COMPOUND

Saves up to 50% of the time required for barrel grinding of small parts, producing a better surface for subsequent burnishing than can be obtained from the usual methods of wet grinding.

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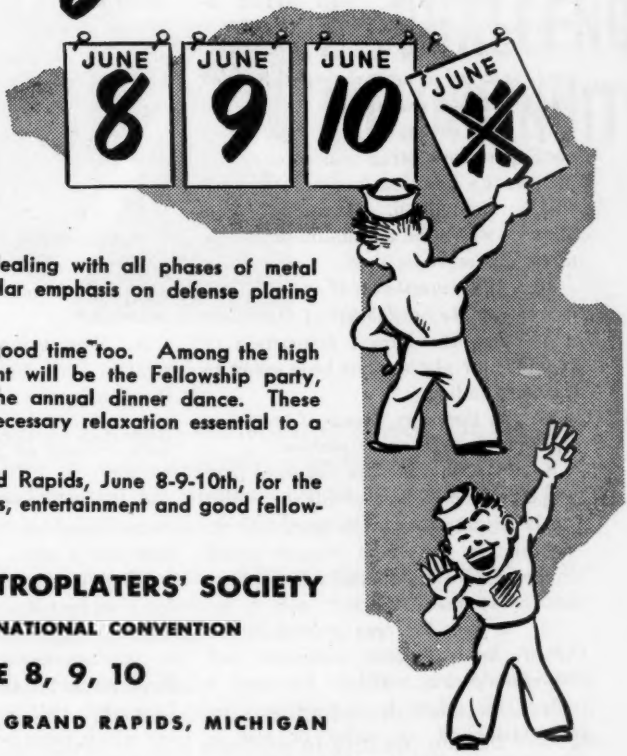

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But we will show you a good time too. Among the high lights of the entertainment will be the Fellowship party, Aunt Ella's party and the annual dinner dance. These events will provide the necessary relaxation essential to a real national convention.

Plan now to be in Grand Rapids, June 8-9-10th, for the best in educational papers, entertainment and good fellowship.

AMERICAN ELECTROPLATERS' SOCIETY

30TH ANNUAL NATIONAL CONVENTION

JUNE 8, 9, 10

PANTLIND HOTEL....GRAND RAPIDS, MICHIGAN

"Remember Pearl Harbor"

ment, Washington, D.C. The cost is 75c for 52 issues.

7. *Do the bright plating limitations refer only to automobiles?*

A. Yes, with some exceptions.

8. *Can copper anodes on hand be used up?*

A. Yes, so far. Order M9c as amended allows production until March 31 on many items, under certain restrictions.

9. *What is the strength of the nitric acid used as a neutralizing bath after cleaning before anodizing?*

A. Any strength from 5-50% according to how often you want to replenish it's function is simply to neutralize the alkali. If antimony is alloyed with the aluminum a strong nitric dip must be used.

10. *Will curtailment of auto production change the availability of Cyanides?*

A. Yes, the largest proportion of cyanides for plating, has been going to the auto industry.

11. *Is there any chance of beryllium copper easing the steel situation?*

A. Hardly. It is for the most part copper which is not available. Also the beryllium ores are scarce. Then, too, all the beryllium copper which can be made has specialized application for defense.

12. *A firm has been ordered by the O.P.M. to discontinue cadmium and chromium plating. Why?*

A. This might be a mistaken interpretation of an order or else a situation peculiar to that company. There is no general order to that effect.

13. *What kind of a tank is used for Bonderizing?*

A. Stainless steel is recommended for long life, but steel may be used.

14. *What method is used for cleaning tin Plate?*

A. Same cleaning as for lead.

A. W. GARRETT, *Secy.*

Detroit Branch

The Detroit Branch of the American Electroplaters' Society held the usual Question Box at the meeting on January 9th. The speaker of the evening, Mr. Steve Hiltebrant of the Bakelite Corporation, kindly consented to answer the questions.

1. *Is screen wire cloth ever impregnated with or pressed between sheets of phenol-formaldehyde type material and for what purpose?*

A. Yes. This is done to give added strength.

2. *How do the vinyl plastics compare with the polystyrene materials in chemical resistance?*

A. They are of the same family. The polystrene material is best.

3. *Are any plastics satisfactory for parts which must be sterilized under steam?*

A. The transparent phenolics or straight phenolics are satisfactory for this application.

4. *What can you tell about preliminary coatings on plastics as a base for plating?*

A. Finely divided copper suspended in a solution of ethyl cellulose can be used for a dip. This will deposit a coating of copper on the article and can then be followed by an acid copper deposit. We would also suggest that anyone interested refer to articles by Hepburn and S. Wein in November and December 1941 issues of *Metal Finishing* which describe the procedure thoroughly.

5. *Is there a plastic fabric which would be suitable for laboratory clothing and also be resistant to strong acids and bases?*

A. Yes. A phenol formaldehyde impregnated cloth called Revolite or a vinyl film called Krene would probably be satisfactory.

6. *Are there any plastics which can*

A CHALLENGE TO INGENUITY!

Emergency conditions challenge the ingenuity of men. In the plating industry — how to make available materials go farther — how to substitute one material for another — how to keep shops producing — these are questions which confront all of us.

There may not be an answer, but, no stones are left unturned; every idea is being thoroughly exploited in the Harshaw laboratories in an effort to solve these problems.

Many things have already been learned — some advances have been put in practice to the advantage of the industry. In any event, the knowledge of materials and methods of plating, gained through the present necessity, cannot but help to advance the plating industry of the future.

In the meantime you can depend on full cooperation of the Harshaw staff in supplying your requirements for anodes and chemicals, as far as possible under present day restrictions.

THE HARSHAW CHEMICAL COMPANY

Cleveland, Ohio, and Principal Cities

be used in liquid form to coat metals and then be converted into a hard but ductile permanent form?

A. Either phenol formaldehyde or vinyl type plastics can be used as described above. The process is known commercially as the Lithcote Process.

EDGAR A. HAHN, *Librarian*

Chicago Branch

1. *How can a highly buffed zinc coating be lacquered and baked without discoloring?*

Ans. Get a lacquer that is neutral to zinc. One member told that he was furnished material, by two large motor companies, that can be sprayed on the zinc and baked for one hour at 350° with no discoloring.

2. *Will activated carbon remove oil from a cyanide plating solution? Does it have to be filtered?*

Ans. Yes. Filter through activated carbon.

3. *Acid copper solution. What makes a .002 deposit brittle? Solution as per Blum and Hogaboom book temp. 90° F. current density 100 Amps per foot, work agitation on bending the copper cracks.*

Ans. After some discussion it was thought that the trouble was due to an overdose of brightener and if it was filtered through activated carbon it would correct the trouble.

4. *What is the formula for hard chrome on drills and reamers? Is it necessary to do special cleaning?*

Ans. The cleaning is very important, use reverse current in a chrome solution. We understand that this is a patented process, either the 250 gr. per liter or the 400 gr. per liter can be used depending on the articles and varying the acid ratio.

5. *What causes a Cad. Solution to gas heavily? Free cy. 6 oz., metal 2½ oz. per gal. 150 gal. tank doing barrel plating Temp. gets up to 100°.*

Ans. A member that is doing large quantities of this work daily suggested as follows: 3 oz. metal, 12 oz. free cyanide, 10 Volts keep solution cold and control the current.

6. *What is the best conducting film to put on porous stone so that copper may be deposited on it?*

Ans. Refer to the Blum & Hogaboom book on this subject. Also there is a series of articles on this subject starting in the December issue of the *Metal Industry*.

J. W. HANLON, *Secy.*

Los Angeles Branch

1. *How can an ordinary cold nickel solution be made to plate bright?*

Ans. Any of the advertised brightners can be used but they are only satisfactory for a light plate.

2. *Is it possible to plate bright nickel over a cyanide copper plate?*

Ans. Yes.

3. *Will stripping nickel from plating racks, made of brass, in a regular nickel plating solution have any effect on future deposits from this solution?*

Ans. This procedure not recommended but it would do no harm if the brass could be prevented from being attacked.

4. *Is it possible to use zinc anodes in combination with cadmium anodes in a cadmium solution?*

Ans. This is not recommended.

5. *Is a rubber lined steel tank suitable for a silver solution? If not, what is recommended?*

Ans. Rubber is not recommended for a silver solution because of the possibility of sulfur in the rubber. An asphalt base lining is recommended.

ERVIN FRAUENHOFF, *Secy.*

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The Abstract Section

CHARLES C. CONLEY, *Chairman, Program and Educational Committee*

Alloy Plating. By CHARLES L. FAUST. *Trans. Electrochem. Soc.* **80**, (Preprint 18) (1941). Cf. *Abstract Section, Monthly Review A.E.S.*, Oct. 1940, p. 798. "The codeposition of two or more metals so as to form a coat of alloy is an old art, but a new science." Alloy plating is in wide use today for decorative and protective finishes (including most bright metal plating); linings for bearings; making special alloys which are too costly or even impossible to prepare otherwise; and other purposes. Electrodeposited alloys frequently have more desirable properties than deposits of single metals, and occasionally are preferred to the same alloy prepared by casting. The underlying principles of alloy electrodeposition are discussed at some length, particularly from the standpoint of one seeking to discover a bath suitable for plating a given alloy. It is emphasized, however, that these principles serve only as a general guide, and final results rest on empirical tests. Certain metals can be plated as constituents of alloys from baths from which the single metals cannot be deposited. When the proper bath has been found, the anode problem must be solved, for which general methods are outlined with several practical illustrations. When the effects and proper operating ranges of the several variables are understood (from empirical tests), alloy plating baths do not differ greatly in adjustment, maintenance, and control from single metal plating baths. The bath constitutients are classified as (1) the primary salts supplying the several metals as ions; (2) secondary salts influencing the ionization of the primary salts; (3) addition agents; (4) buffer compounds; (5) conductivity salts; (6) salts promoting anode solubility. As in single metal plating, for which this classification also applies, the constituents are so chosen as to achieve desired physical properties of the plate, as well as suitable current efficiencies, throwing power, conductivity, and anode solubility; the only distinction in the case of alloy plating is the requirement of at least one primary salt for each metal to be deposited, and the requisite of uniform composition of the deposit. The production of periodic bands in alloy deposits, the undesirability of using insoluble anodes, the influence of common variables, the operation of the baths, and preparation of the basis metals are discussed. Decreasing the current density, increasing agitation, and increasing temperature generally increase the proportion of the nobler metal in the deposit; but the relative nobilities of the metals may differ from that indicated by the standard e.m.f. series. The paper is a discussion of general principles and experience in alloy plating rather than an outline of specific examples. It is an indispensable guide to investigators in this field, as well as to platers desiring a general grasp of the subject. For a general summary and bibliography of alloy plating, see CHALRES L. FAUST, *Trans. Electrochem. Soc.* **78**, 383 (1940).

ERNEST H. LYONS, JR.

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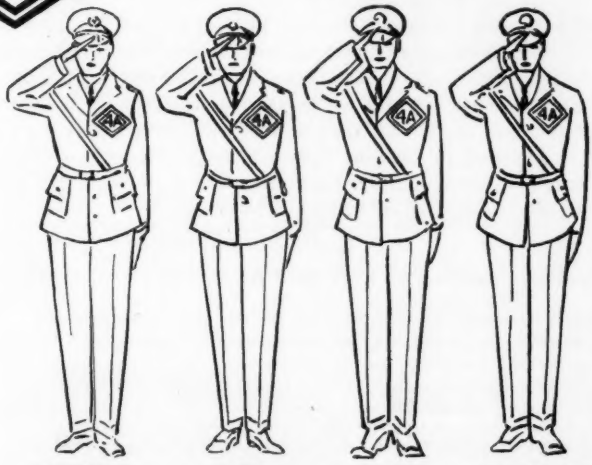

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Electroplated Tin as Finish for Brass and Copper-rich Alloys By E. E. HALLS. *Metallurgia* **22,** 189-92 (1940). Electrodeposits of tin, when more than 0.00025 in. thick, are more resistant than is nickel plate in some salt-spray and outdoor exposure tests. Alkaline stannate plating baths, operated at 158-178° F. at not more than 15 amps./sq. ft. with nickel anodes, give satisfactory deposits on brass.

Brit. Chem. Phys. Abstrasct; *Chemical Abstracts.*

Nickel-plating on Zinc. By W. ECKARDT. *z Metall-u. Schmuckwaren.-Fabr. Verchrom.* **20,** 275-6 (1939); *Chem. z entr.* **1939, II,** 2154. Direct nickel plating on zinc, especially in hot nickel baths, is not to be recommended. It is more satisfactory to undercoat the zinc with copper or brass.

M. G. MOORE. *Chemical Abstracts.*

Proper Plating Procedure. By RAYMOND F. YATES. *Am. Machinist* **85,** 381-3 (1941). Details are given for hard chromium plating on steel with a bath containing 300 g. (never less than 285 g.) chromic acid and 4.1-4.4 g. H_2SO_4/liter at 130-140° F. and up to 300-800 amp./sq. ft. of surface plated. An anodic pickling in 50° Be. H_2SO_4 with lead cathodes and a c.d. of 50 amps./sq. ft. is used in cleaning before plating. Chromium plate can be stripped anodically in a solution containing 112 g./1. Na_2CO_3, $NaHCO_3$ or NaOH with steel cathodes, 5-6 v. and 50 amp./sq. ft.

G. W. AYERS. *Chemical Abstracts.*

Tin electrodeposition and its field in industry. S. BAIER and W. H. TAIT. *J. Electrodepositors' Tech. Soc.*, Vol. **16,** pp. 45-54 (1940). The advantages of electrodepositing tin over hot-dipping are discussed. Tin may be electrodeposited in any thickness whereas coatings obtained by hot-dipping lie between 0.0001 and 0.001 in. in thickness. The electrodeposited coatings are more uniform in thickness than hot-dipped coatings. By electrodeposition, tin may be applied to any common base metal; hot-dipping cannot be applied to lead or lead alloys or to soft soldered articles because of the low m.p. of the tin-lead alloy. Zinc cannot be hot-dipped because it contaminates the molten tin, and to a smaller extent brass gives the same trouble. On some objects it is advantageous to use hot-dipping to seal seams and crevices and then to use electrodeposition to produce a thicker coating. Tin can be more readily applied to articles of intricate shape by electrodeposition than by hot-dipping. In electrotinning the interior or large vessels, the vessel itself is made the plating tank. For this purpose the stannate bath is preferable to the acid bath as in the latter bath; tin anodes produce a slime which falls to the bottom and results in a rough coating. Refrigerator parts and dairy equipment are plated with 0.0005 to 0.001 in. of tin. Food processing equipment is plated with 0.002 to 0.012 in. of tin. In addition to its uses as a corrosion resistant coating, the following special uses of electrotinning are discussed: antifriction coating for pistons and piston rings; pretinning before soldering; production of water tight joints. A BRENNER

Electrolytic Etching. By SAMUEL WEIN, *Metal Finishing*, October 1941, Page 546. Author discusses method for electrolytically etching copper, brass and steel plates. Processes are described in detail, explaining printing method, resist used, and etching solutions recommended.

Nickel Plating. By W. L. PINNER, G. SODERBERG, and E. M. BAKER. *Trans. Electrochem. Soc.* **80** (Preprint 23) (1941). Nickel coatings are applied mainly for the corrosion protection of zinc die-castings, brass,

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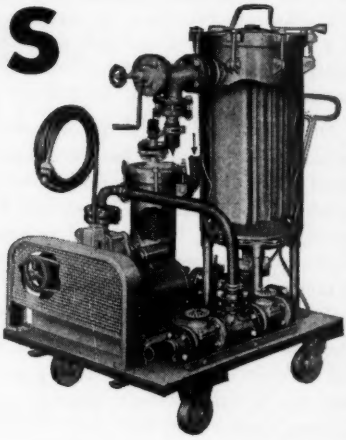

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and steel where good appearance is important, and are usually covered with a thin plate of chromium to prevent tarnishing. After outlining the history of nickel plating, the authors predict better bright nickel deposits ductile enough to withstand fabrication, and the use of heavier coatings for increased corrosion protection, in the future.

The double salt bath, the high sulfate bath for plating on zinc, the zialite bath, and the chloride bath are described, but most of the discussion is devoted to the Watts bath and its modifications as bright nickel baths. Bright nickel plating eliminates or reduces the costly nickel buffing, with its accompanying reduction in corrosion resistance through the loss of nickel. The functions of the several bath constituents, and the use of hydrogen peroxide to control pitting are explained,.

Addition agents used to produce bright nickel plating are of two classes. The *first class*, which includes cobalt salts and aryl sulfonic acids, sulfonamides and sulfonimides, produces finer grain structures and occasionally mild brightness, but functions chiefly as carrier of addition agents of the second class, enhancing their effect, and permitting higher concentrations of inorganic substances, as well as larger amounts of impurities. The concentration of addition agents of this class is generally limited only by their solubilities.

The *second class* includes materials such as salts of cadmium and zinc, sodium formate, aldehydes and ketones, and amino poly aryl methanes, which by themselves are very critical as to concentration, and tend to produce brittle, bright plates. It is best to use a material of the first class having a maximum carrying ability, together with an active material of the second class, which, when used alone, may produce brittleness and poor adhesion. The combination results in superior brightness and adequate ductility. Other factors involved in the choice of addition agents are specified.

The following composition is given for the Watts bath:

	Recommended	*Limits*
Nickel sulfate, $NiSO_4.7H_2O$	32 oz./gal.	15-50 oz./gal.
Nickel chloride, $NiCl_2.6H_2O$	6 oz./gal.	2-10 oz./gal.
Boric acid, H_3BO_3	4 oz./gal.	2 - 6 oz./gal.
pH (electrometric)	1.5-3.0, or 4.5-5.6	
Current density	40 amp./sq. ft.	20-60 amp./ sq. ft.
Temperature	110° F.	

The current density, temperature, pH, and degree of agitation are interrelated, as illustrated and explained, along with characteristics of current efficiencies and throwing power. The modifications which are made in the bright nickel baths are pointed out. The various sources of contaminants are listed; they are eliminated by filtration, clarification, and purification by adsorption, neutralization and precipitation, and electrolysis, which are described. The control of pH is emphasized. The control of surface tension to reduce pitting, in bright nickel baths where hydrogen peroxide can not be used, is outlined. Complete analytical procedures suitable for plant control are given in some detail.

Anodes used today contain more than 99% nickel; typical analyses are

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given. The rolled depolarized anodes, containing small amounts of nickel oxide, are widely used, generally in bags to retain the loose nickel particles which form, and which may cause pitting or roughness if suspended in the bath. The cast carbon-nickel and rolled carbon-nickel anodes form a carbon-silica film which holds back loose nickel particles if they are not present in excessive amounts; these anodes are used only when the pH is below 4.5. Specifications and testing of anodes are mentioned.

Polishing and buffing procedures are outlined. To secure good corrosion resistance, the basis metal should be as sound as possible, and polishing and buffing should be very carefully done, using as fine grain materials as are suitable. Anodic electrocleaning and muriatic acid pickling are extensively practiced before plating. Any cold-worked, fragile or easily embrittled surface layer of the basis metal must be removed. Copper undercoats are common, and reduce the porosity of the plate because they cover imperfections in the surface better than does nickel; moreover, they insure cleanliness. On zinc surfaces, nickel may be deposited only from special baths; heavy copper undercoats are generally preferred. Thickness specifications and other characteristics of the plate are discussed. The microscope test, magnetic test, and salt spray are suggested, and a number of tests for adherence are described.

ERNEST H. LYONS, JR.

Rochelle Copper Plating. By A. KENNETH GRAHAM and HAROLD J. READ. *Trans. Electrochem. Soc.* **80** (preprint) (1941). Cyanide copper plating is used for cleaning and undercoating before plating other metals; to prevent case hardening of selected portions of iron and steel surfaces; as a heavy undercoat for nickel and chromium plate; for oxidized and other finishes, and other purposes. The high concentration cyanide copper bath permits heavier deposits at higher rates, but experiences difficulties at the anodes which are solved by the addition of Rochelle salt. The recommended formula is:

	Recommended	*Approx. Limits*
Copper cyanide CuCN	3.5 oz./gal.	2.5-6 oz./gal.
Sodium cyanide, NaCN	4.6 oz./gal.	3.5-7 oz./gal.
Sodium carbonate, Na_2CO_3	4.0 oz./gal.	2 -8 oz./gal.
Rochelle salt	6.0 oz./gal.	4 -8 oz./gal.
Copper	2.5 oz./gal.	2 -4 oz./gal.
Free sodium cyanide	0.75 oz./gal.	0.5-1 oz./gal.
Sodium hydroxide, NaOH, to give a pH of	12.6	12.2-12.8
Cathode current density		18-56 amp./sq.ft.
Cathode efficiency		30-70%
Anode current density		9-28 amp./sq.ft.
Anode efficiency		50-70%
Temperature		122-176°F.

It is recommended that 5% of the anode area should be iron. The function of the several constituents of the bath, use of sodium sulfite, bisulfite, thiosul-

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fate, or lead as addition agents, effect of carbonate, operating conditions, throwing power, polarization, purification, maintenance, control, and anodes are described in detail. Complete directions are given for testing the solution and the deposits, together with thickness specifications. The preparation of zinc die-castings and steel for copper plating are outlined.

ERNEST H. LYONS, JR.

Iron Deposition. By C. T. THOMAS. *Trans. Electrochem. Soc.* **80** (preprint 15) (1941). Inasmuch as iron is commonly coated with other metals in order to correct its deficiencies in surface properties, particularly corrosion resistance, it is not surprising that the same surface weaknesses render iron coatings useless for ordinary electroplating purposes. Iron is electrodeposited to produce metal of high purity, and for electroforming purposes, such as the manufacture of sheets and tubes by electrodeposition, the building-up of overmachined or worn machine parts, making plates for printing United States currency and bonds, and electroforming molds for rubber, glass, and plastics. Iron can be electrodeposited either as a hard, brittle metal which can be made soft and malleable by heat treatment, or as a soft, ductile metal with superior drawing properties, subject to surface hardening by carburizing, cyaniding, or nitriding. High purity iron is more resistant to rusting than other forms, and can develop unusual magnetic properties. Bath compositions are:

Sulfate Bath	*Chloride Bath*
$FeSO_4$. $(NH_4)_2SO_4.H_2O$..47 oz./gal.	$FeCl_2.4H_2O$....53-67 oz./gal.....
Additions: $MgSO_4$, Na_2SO_4, if desired.	Additions: NaCl, $CaCl_2$, $MgCl_2$ if desired.
Acidity: 0.01-0.02 N H_2SO_4; or pH = 6.	Acidity.....0.01 N HCl.
Temperature.....140° F.	Temperature.....194° F.
Current density..65 amp./sq. ft. (19 amp./sq. ft. at room temperature)	Current density....60 amp./sq. ft. (up to 280 amp./sq. ft. at higher temp. and acidities)

Either bath may occasionally require reduction by scrap iron and acid, or operating with dummy cathodes, to remove ferric iron. Equipment, which must be especially corrosion resistant, anodes, control of baths, physical characertistics of the deposits, etc., are discussed.

ERNEST H. LYONS, JR.

Control of Plating Baths. By Raymond F. Yates. *Am. Machinist* **85**, 426-8 (1941). In hard chromium plating, if the CrO_3:H_2SO_4 ratio of the bath falls much below 73:1, gray, rather than bright, chromium is deposited; if the CrO_3 content drops below 285 g./1., the plate has a tendency to "burn" and peel. Simple procedures are given for the determination of (1) CrO_3 (hydrometer method); (2) sulfate ion ($BaSO_4$ collection in a centrifuge tube); and (3) chromic ion (precipitation with NH_4OH, oxidation with H_2O_2, addition of KI and titration of the liberated iodine with thiosulfate) in the plating bath. Most of the chromic ion can be oxidized to chromic acid, H_2CrO_4, by electrolysis overnight with an iron cathode in clay diaphragm.

G. W. AYERS. *Chemical Abstracts.*

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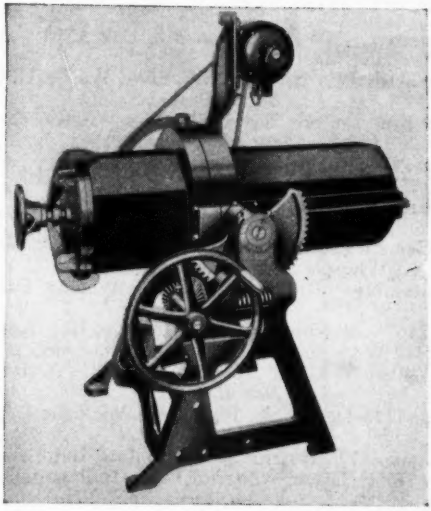

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To February 1, 1942

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John J. Slattery, 715-5th St., N. E., Wash., D. C. Active
Bernard E. Burmeister, 4306 Barrington Rd., Balt., Md. Active
Frank Collins, Ferndale, Md. Active
Clarence M. Shepherd, 3959 Nichols Ave., S.W., Wash., D. C. Associate

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John R. Edwards Associate
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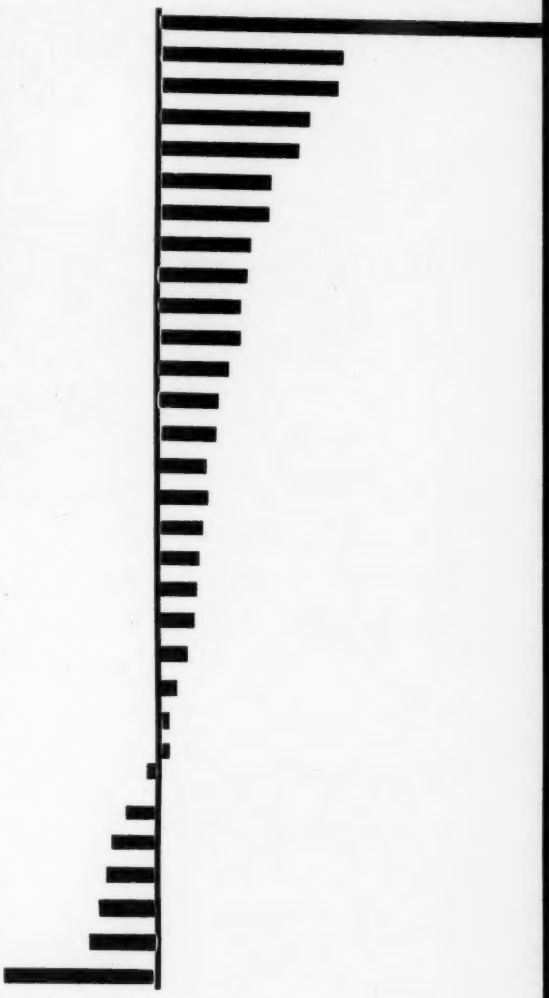
MEMBERSHIP CAMPAIGN REPORT

BRANCH	May 1, 1941	Change in Membership	Percent Change
Balt.-Washington	43	+25½	+59.3
Montreal	29	+8	+27.6
Hartford	48	+13	+27.1
Toronto	66	+15	+22.7
San Francisco	38	+8	+21.1
Indianapolis	39	+6½	+16.7
Dayton	79	+13	+16.5
Pittsburgh	43	+6	+13.9
New York	121	+16	+13 2
Grand Rapids	77	+9½	+12.3
Bridgeport	72	+8½	+11.8
Boston	102	+10½	+10.3
Rochester	76	+6½	+ 8.6
Newark	136	+11½	+ 8.5
Chicago	234	+17	+ 7.3
Los Angeles	121	+8½	+ 7.0
Waterbury	87	+5½	+ 6.3
Buffalo	49	+3	+ 6.1
Prov.-Attleboro	44	+2½	+ 5.7
Detroit	260	+13½	+ 5.2
New Haven	100	+4	+ 4.0
Toledo	44	+1	+ 2.3
Cleveland	80	+1	+ 1.3
Milwaukee	92	+1	+ 1.1
St. Louis	79	—1	— 1.3
Springfield	69	—3	— 4.3
Anderson	40	—2½	— 6.3
Philadelphia	150	—11	— 7.3
Cincinnati	53	—4½	— 8.5
Lancaster	44	—4½	—10.2
Binghamton	22	—5	—22.7



NOTE: Honorary members are included with each Branch.

MEMBERSHIP — May 1st, 1941 = 2537
MEMBERSHIP — Feb. 1st, 1942 = 2 710
GAIN IN MEMBERSHIP 183
GAIN = 7.2%

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Harry Weaver, 375 Highland Ave., Rochester, New York Associate
Robert Berggren, 1297 Park Ave., Rochester, New York Associate
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Michael Andrews, 215 Bernard St., Rochester, New York Associate
David H. Penn, Hilton, New York Associate
Emil C. Fasson, 1075 Exchange St., Rochester, New York Associate

Toronto Branch

A. Acheson, 47 Abbott Ave., Toronto, Ont., Canada Associate
B. J. Stockley, Jr., 156 Gough Ave., Toronto, Canada Associate

APPLICATIONS

Baltimore-Washington Branch

Jack E. Perrone, 2504-10th St., N.E., Washington, D.C. Active
Arthur Singer, 5746 Colorado Ave., Washington, D.C. Active
Walter D. Sietz, 829 Schley St., Maryland Park, Md. Associate
Bush F. Willenborg, 914-C-St., S. E., Washington, D.C. Active
Seymour Kaplan, 3343-17th St., N.W., Washington, D.C. Associate
Christopher M. Keller, 1124-Morse St., N. E., Washington, D.C. Associate
Frank H. Bock, 647 Eye St., S. E., Washington, D.C. Active
John Willard Shanklin, 607 Daniels St., Colmor Manor, Md. Associate

Buffalo Branch

J. Robert Guy, R. F. D. #5, Lockport, New York Associate

Chicago Branch

R. D. Wysong, 108 S. 21 St., South Bend, Indiana Active

Cincinnati Branch

Horace Abbott Chipman, 1715 Elm St., Cincinnati, Ohio Associate

Detroit Branch

Harvey C. Deike, 22283 Michigan Ave., Dearborn, Mich. Associate
Donald F. Spengler, 22283 Michigan Ave., Dearborn, Mich. Associate

Los Angeles Branch

G. Perkins, L. H. Butcher Company, Los Angeles, Cal. Associate

Newark Branch

George V. Galanti, Western Electric Co., 100 Central Ave., Kearney, N. J. Associate

New York Branch

Albert George Fusco, W. L. Maxon Corp., N. Y. C. Associate
Ernest Feldman, Toller & Cooper Co., Jersey City, N. J. Active
John A. Jansson, Magnuson Products Co., Brooklyn, N. Y. Associate

Philadelphia Branch

Frank C. Boettinger Active
Joseph Mazia Associate

Rochester Branch

Eugene G. DeWitt, 1657 South Ave., Rochester, N. Y. Associate

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John Koster, Basic Magnesium, Inc., P. O. Box 1150, Las Vegas, Nevada Active

Syracuse Branch

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Toledo Branch

Charles Young Active

TRANSFERS

Donald Wood from Providence to New Haven Branch
Bert W. Sage from Boston to Waterbury Branch
James Monagle from Newark to Indianapolis Branch
Stanley A. Harris from Detroit to Newark Branch
Carroll F. Matthews from Indianapolis
R. E. Pettit from Rochester to Pittsburgh Branch
E. P. Swartz from Rochester to Syracuse Branch
R. O. Warner from Rochester to Syracuse Branch